

# **On-Site Review of Electric Utility SCADA/EMS Year 2000 Readiness Programs**

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U.S. Department of Energy**

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## Executive Summary

### Background

In May 1998, the United States Department of Energy (DOE) asked the North American Electric Reliability Council (NERC) to assume a leadership role in facilitating preparations of the electric power production and delivery systems of the United States for transition into the Year 2000. In response, NERC defined a program for coordinating the Y2k preparedness efforts of the organizations that operate interconnected electric power systems in North America (including the United States, Canada, and the Northern Baja California Norte area of Mexico). The goal of the NERC Y2k program is to facilitate processes that, when implemented, allow these electric power production and delivery systems to operate reliably into the Year 2000.

As part of the Y2k readiness reporting process, NERC has provided five quarterly reports to DOE on the status of Y2k efforts in the electric power industry. The most recent report was delivered to DOE on November 18, 1999. A copy of that report may be found at the NERC web site at <http://www.nerc.com/y2k/>. This latest NERC report provides these findings and others:

- NERC believes the electric systems of North America will operate reliably into the Year 2000 with the facilities that are Y2k Ready today.
  - 99.9% of bulk electric facilities are Y2k Ready.
  - 99.8% of distribution facilities are Y2k Ready.
  - 296 bulk electric systems were disclosed by name as Y2k Ready or Y2k Ready With Limited Exceptions
  - Y2k testing appears to indicate minimal impacts on the ability to produce and deliver electricity

One basis for the NERC Y2k status assessments is the receipt of monthly reports from nearly 300 of the largest organizations operating bulk electric facilities. These self-reported data address the Y2k readiness status in the areas of generation (non-nuclear), control centers, transmission, distribution, substations, telecommunications, and business systems.

The Y2k readiness status of commercial nuclear power facilities is reported separately to the Nuclear Regulatory Commission in a process facilitated by the Nuclear Energy Institute. The Nuclear Energy Institute provides information to NERC and DOE on nuclear facilities to coordinate those results with the rest of the industry. NEI has publicly stated that all nuclear power facilities in the USA are 100% Y2k Ready at this time.

In support of this industry reporting effort, the American Public Power Association (APPA) and the National Rural Electric Cooperative Association (NRECA) surveyed their respective sectors (public power and rural electric cooperatives) on a quarterly basis. Substantial progress has been seen in local distribution systems. Both the APPA and the NRECA report Y2k Ready status for distribution organizations that serve more than 99.8% of customers (meters) in

their respective sectors. NRECA has released an Honor Roll indicating the 830 rural cooperatives it believes to be Y2k Ready.

### **Purpose of this Report**

Although the industry-reported results are reassuring, DOE, as the responsible federal agency for commercial electric power, desires to further validate these results. The enclosed study was commissioned by DOE as a follow up to the initial (Phase 1) on-site reviews of the electric power industry that was commissioned in April 1999, and reported in September 1999, under the title "On-Site Review of Electric Utility Year 2000 Readiness Programs." DOE commissioned this current study in September 1999, based on the results of the initial on-site reviews of 36 organizations.

The initial study found six of the 36 organizations to be Level 2: "Company has some issues that cause concern in meeting NERC Y2k readiness date (6/30/99), but should be Y2k Ready by 12/31/99. There is a need to continue to monitor company's progress." Of the six Level 2 ratings, five were because of lateness in remediation of Energy Management Systems/Supervisory Control And Data Acquisition (EMS/SCADA) systems. These are mission-critical systems for the generation, transmission, and distribution of electric energy. They are also specialized, software intensive systems with components from a number of vendors. The other Level 2 rating was due to lateness in remediation of a Distributed Control System (DCS) at a generating station, a mission-critical system for the production of electric energy at that station.

One of the recommendations from the initial on-site review report was to follow up on the reasons for the lateness in the remediation of these mission-critical systems. The objectives of the Phase 2 on-site reviews is to determine:

- The ability of EMS/SCADA and DCS vendors to support their customers' Y2k upgrades, testing, and certification requirements in a timely manner.
- If there are problems with the above, what can be done to alleviate these problems in time to assure Y2k readiness of these systems?

### **On-site Review Process**

DOE contracted a team of independent consultants to perform on-site audits at a randomly selected sample of electric power organizations. The 20 entities selected for on-site reviews represent slightly less than 0.65% of the over 3,100 electric power organizations in North America. There are 417 organizations in the total population with EMS/SCADA systems. In addition to the organizations randomly chosen from this EMS/SCADA population for the Phase 2 on-site reviews, the random sample also includes three independent power producers, which do not have EMS/SCADA systems. Thus, the number of organizations with EMS/SCADA systems in the sample represent about 4% of the relevant population. This sample size is believed to be acceptable and meets the objectives of the Phase 2 on-site reviews.

It was also important to get the on-site reviews completed quickly, as time was of the essence. The on-site review teams conducted their audits during September and October 1999 and prepared this Phase 2 report based on their findings. The audits included interviews with Y2k program personnel, review of Y2k EMS/SCADA and DCS program documentation, and rerunning of selected Y2k

tests on these mission-critical systems in the presence of the on-site review team when possible.

The results presented in this report are intended to be representative of the industry and are not intended to disclose the status of an individual organization. The results are presented in detail for each site visit. However, the identity of each organization participating in the on-site reviews is masked.

The sample for the Phase 2 on-site reviews included the following mix of organizations:

- Six Municipals
- Five Investor Owned Utilities (IOU)
- Four Rural Electric Generation & Transmission Cooperatives (G&T)
- Three Independent Power Producers (IPP)
- One Rural Electric Distribution Cooperative
- One Federal Agency

## Results

All 20 entities that were randomly selected for review agreed to allow an on-site audit of their Y2k program. There were no refusals to participate.

The table below lists the results for the 20 on-site reviews.

### Y2k Readiness Evaluations of 20 Electric Power Organizations

<i>Level 1<sup>1</sup></i> Not Y2k Ready by December 31, 1999	<i>Level 2<sup>2</sup></i> Y2k Ready by December 31, 1999	<i>Level 3<sup>3</sup></i> Y2k Ready by October 31, 1999
0	1	19

The on-site review team determined that all 20 of the organizations visited are very likely to be Y2k Ready prior to the year-end transition. Nineteen of the organizations were determined to be Y2k Ready by October 31, 1999. The remaining organization demonstrated a high probability of being Y2k Ready prior to the Year 2000. In this case, the remaining remediation was scheduled to be completed by November 1, but was rescheduled to accommodate personnel training. It will be completed by November 30. This delay poses no serious threat to being Y2k Ready by year-end. A follow-up call to the organization confirmed that the work has been completed, and the organization is now Y2k Ready.

<sup>1</sup> The entity is not likely to meet the Y2k readiness date (October 31, 1999), and may not be Y2k Ready by December 31, 1999.

<sup>2</sup> The entity has some issues that cause concern for meeting Y2k readiness date (October 31, 1999), but should be Y2k Ready by December 31, 1999. There is a need to continue to monitor the company's progress.

<sup>3</sup> The entity should meet Y2k readiness date (October 31, 1999) and will be Y2k Ready by December 31, 1999.



The following general conclusions were made as a result of the on-site visits:

- The organizations visited had applied the necessary resources (both staff and money) to their Y2k projects to address the Y2k issue as related to delivery of reliable electric power. These organizations exhibited a sense of urgency for the Y2k issue. Funding was not a major limitation in addressing Y2k at any of the organizations visited. Whether it was hiring consultants, repairing or replacing devices, components, or software, the necessary funds were made available. There were instances in which it was decided, based on economic considerations, to use a workaround to resolve a Y2k problem, instead of spending more dollars to repair or replace the item.
- All organizations by the date of the visits expressed a high degree of confidence in their Y2k readiness. All were proud of their efforts and many wanted to "show off" all that they had done.
- The organizations reviewed had all recognized early in the process the mission-critical nature of their EMS/SCADA/DCS systems and took early steps to assess, prioritize, and remediate any problems. In several cases, the early attention proved to be the single most important factor in meeting the industry deadlines and year-end readiness.
- There were no known geographic differences encountered in the project. The level of effort was consistent across the continent.
- The vendor delays that affected the results of the Phase 1 on-site reviews were no longer an issue.
- Final EMS/SCADA vendor signoff was missing at some organizations, though in some cases receiving the signoff was prompted by the visit. Larger organizations generally had the vendor signoff much earlier than the visit. All organizations tested the EMS/SCADA system, regardless of the vendor compliance statement.
- As part of their contingency plans, the sample organizations often relied on manual EMS/SCADA operations even if the organization is declared Y2k Ready. This usually means positioning people in substations to supply critical substation information.

The on-site review process in Phase 2 supports the conclusion that the electric power industry has completed the necessary work to be Y2k Ready for all its mission-critical systems, with the exception of a few specific items.

Regarding the specific objectives of the Phase 2 on-site reviews, the results follow:

*The ability of EMS/SCADA and DCS vendors to support their organization customers' Y2k upgrade, testing, and certification requirements in a timely fashion.*

The vendors of these mission-critical systems have been able to catch up with their backlog of work. There were no Level 1 or Level 2 ratings that can be attributed to problems with vendor support. This conclusion indicates that the

problems found with timely vendor support during the Phase 1 on-site reviews was a temporary problem that the vendors have been able to resolve.

*If there are problems with the above, what can be done to alleviate these problems in time to assure Y2k readiness of these systems?*

Because no significant problems were found with vendor support, this objective is moot.

As in the Phase 1 on-site reviews, the self-reporting of the organizations was checked against the on-site review results of the Phase 2 on-site reviews. The results also were consistent. Of the 20 organizations in the sample, 14 reported to NERC. Of those, 13 reported results to NERC that were consistent with the on-site reviews. The results reported to NERC for EMS/SCADA and DCS systems were in close agreement with the findings of the on-site reviewers.

### **Recommendations**

The on-site review team recommends that organizations complete the work to document their Y2k projects. A consistent finding of the on-site reviewers was that the work had been done, but in too many cases, it had not been adequately documented. Some examples of documentation problems included incomplete test information, support documents, such as vendor certifications, not in the file and project documents spread out throughout the organization.

In addition, contingency plans need to be completed and drilled to ensure that, if any emergency arises during the transition to the new millennium, the contingency plans will be complete, the resources available, and the people trained to respond quickly and effectively.

The electric industry has done the hard work needed for Y2k readiness, it now must continue to keep the general public and its customers informed of its Y2k status to keep public confidence high regarding the electric industry's ability to keep the lights on during the Y2k transition.

## **I Introduction**

### **I.a Electric Industry Self-Assessment Process**

The electric industry is responsible for supplying one of the most important services for public health and safety. It is, therefore, critical that the lights stay on during the Year 2000 (Y2k) transition and during the leap year day that occurs in the Year 2000.

The U.S. Department of Energy (DOE) has asked the North American Electric Reliability Council (NERC) to take the lead in determining the Y2k readiness of the electric power industry. NERC's focus is primarily on the mission-critical aspects of the electric system – in other words, those devices and systems needed to keep the lights on.

For more than a year, NERC has been receiving monthly reports from the larger electric power organizations on their Y2k progress in the areas of generation (non-nuclear), control centers, transmission, distribution, substations, business systems, and telecommunications. The Y2k readiness status for nuclear power generation is reported to DOE by the Nuclear Energy Institute. On a quarterly basis, NERC aggregates the monthly information it received from the industry and issues a report to DOE (and the public at large) on the overall progress of the industry. A final report was issued in August 1999 with a shorter follow-up report in November 1999. All monthly Y2k readiness reporting entities that were Y2k Ready or Y2k Ready With Limited Exceptions were identified in these reports.

Parallel to the NERC reporting effort, the American Public Power Association (APPA) and the National Rural Electric Cooperative Association (NRECA), the trade associations for the municipal/state public power and rural electric cooperatives respectively, received Y2k status information from their sectors using surveys similar to the NERC monthly reporting document. The results of these reporting efforts were aggregated for each sector and reported to DOE as part of the quarterly NERC Y2k status reports.

### **I.b Independent Reviews of Y2k EMS/SCADA Systems Readiness**

During the months of May, June, and July 1999, independent Y2k reviews of mission-critical systems were performed at 36 organizations across North America. The results of these reviews were reported in the September 1999, "On-Site Review of Electric Utility Year 2000 Readiness Programs" report. The independent review effort was designed to address two main issues: the validity of self-reported data in the NERC/APPA/NRECA survey processes and the Y2k readiness status of smaller organizations' mission-critical electrical systems.

The results of the on-site reviews showed that the self-reported data was reasonably accurate, and that smaller organizations were making the necessary efforts to be Y2k Ready before the end of the year. One of the findings of the Phase 1 reviews was that some organizations reported they would not be Y2k Ready by the NERC readiness target date of June 30, 1999 due to the lateness of remediation and retesting of their Energy Management System/Supervisory Control And Data Acquisition (EMS/SCADA) systems. This delay was cause for

concern, since EMS/SCADA systems are mission-critical systems in most electric organization operations.

Because the on-site reviews had proven to be a satisfactory method for assessing the accuracy of the self-reporting of data by the organizations, it was decided to use the same method to investigate the reasons for the lateness of the EMS/SCADA systems readiness dates. Twenty organizations were selected for on-site reviews of their EMS/SCADA systems. The organizations in the sample were chosen from all categories of the electric power industry in the United States and Canada. This sample included investor owned utilities (IOUs), municipals, rural electric cooperatives, independent power producers (IPPs), and state and federal organizations.

To complete the project within the short schedule, it was imperative to develop a standard on-site review process with appropriate reporting documentation that could easily be replicated by multiple project teams, as had been done for the previous Phase 1 on-site reviews. The on-site review documents from the previous Phase 1 on-site reviews were modified to meet the needs of Phase 2.

The on-site review documents are listed below (examples of each of these documents are shown in Exhibits I and III):

- Telephone Form for Setting On-site Visit
- A Checklist for Utility Program Review
- On-site Review Confirmation Letter
- Y2k Readiness On-site Check List
- Meeting Agenda
- Y2k On-site EMS/SCADA Interview
- Y2k Electric System Readiness Assessment
- Y2k Readiness Evaluation of EMS/SCADA Systems
- Profile of Organization Visited

The review teams were comprised of engineers with considerable professional experience in all aspects of the power sector and particular expertise in EMS/SCADA and DCS systems. The team represented many years of electric organization experience working with systems very similar to those deployed by the sample organizations. The reviewers were familiar with the operations of the electric industry and their potential vulnerability to Y2k problems, and most had been members of the review teams that conducted the Phase 1 on-site reviews.

### **I.c Objectives of the Project**

The objectives of the Phase 2 on-site reviews of the 20 selected organizations were to answer the following questions:

- What were the reasons for the lateness of EMS/SCADA Y2k remediation efforts?
- Was it a general problem with all vendors of EMS/SCADA systems or a subset of the vendors?
- Was it a scheduling problem with the electric organizations?
- Was it a resource problem with the EMS/SCADA vendors?

- Were the EMS/SCADA system Y2k problems numerous and difficult to remediate?

Based on the results of the on-site reviews, a recommended course of action to resolve the issues would, if appropriate, be formulated.

## **I.d Contents of The Report**

This report documents the on-site review process and details the findings on the Y2k readiness of EMS/SCADA systems. The chapter or section headings define the structure of the report:

<b>Executive Summary</b>	Summary of findings, overview description of the project, and statement of readiness level.
<b>I. Introduction</b>	Background, objectives, and methodology of the project.
<b>II. Selection of Y2k On-Site Review Organizations</b>	Sampling, statistical analysis, and confidentiality/anonymity.
<b>III. Overview of On-Site Review Process</b>	Review procedure, evaluation, criteria, and result presentation.
<b>IV. Procedures and Practices for EMS/SCADA and DCS Y2k Project Phases</b>	Details of the Y2k project Phases.
<b>V. Project Results</b>	Findings — overall and by sector.
<b>VI. EMS/SCADA/Real-time Concerns of Project Participants</b>	Special issues regarding project scope of concern to the sample organizations.
<b>VII. Comparison of On-Site Reviews and Self-Reports to NERC, APPA, and NRECA for EMS/SCADA/Real-time Systems</b>	Comparison of on-site reviews with data reported by the selected organizations
<b>VIII. Conclusions and Recommendations</b>	Overall project conclusions, observations, and Y2k project recommendations

## II Selection of Y2k On-Site Review Organizations

### II.a Sampling Procedure

It was determined that a maximum of 20 organizations could be reviewed given the available resources and time constraints. The sampling data for the review selection process included:

- G&T cooperatives with annual sales exceeding one million MWh.
- Distribution cooperatives with annual sales exceeding one million MWh.
- Federal agencies reporting to NERC as "bulk power" entities during the 13 month period of the NERC Y2k readiness assessment process.
- Investor owned utilities (IOU's) reporting to NERC as "bulk power" entities during the 13 month period of the NERC Y2k readiness assessment process.
- Independent power producers (IPPs) reporting to NERC as "bulk power" entities during the 13 month period of the NERC Y2k readiness assessment process.
- Public power organizations (above selected thresholds of size, considering number of customers, generation, and sales).

NRECA provided lists of G&Ts and distribution cooperatives with annual sales exceeding one million MWh. APPA provided a list containing the top 100 public power organizations by generation, sales, and customers. The remaining organizations were extracted from the "bulk power" entities that reported to NERC during the 13-month period of the NERC Y2k readiness assessment process.

Federal Agencies with multiple NERC reporting units were grouped as one organization for the selection process. If a Federal Agency that had been grouped was selected, a random selection among the units would have been made.

Organizations that had been reviewed during Phase I were excluded from the population from which the sample was selected.

The final list of entities used to select the organizations for review included 417 organizations.

- 55 G&T Cooperatives
- 44 Distribution Cooperatives
- 8 Federal Agencies
- 99 Investor Owned Utilities (IOUs)
- 59 Independent Power Producers (IPPs)
- 152 Public Power Organizations

The number of reviews by organization type was selected in direct proportion to the type of organization to the total sample. Table II-1 summarizes the number of organizations selected by organization type.

**Table II-1 Organizations by Type**

<b>Organization Type</b>	<b>Sample</b>	<b>Proportion to Total Sample</b>	<b>Number Selected</b>
G&T Cooperative	55	13.0%	3
Distribution Cooperative	44	10.5%	2
Federal Agency	8	2.0%	1
IOU	99	24.0%	5
IPP	59	14.0%	3
Public Power Organizations	152	36.5%	6

The number of public power organizations selected by proportion was reduced to six (from seven) to accommodate the schedule and to ensure a Federal Agency was reviewed.

Using a random number generator by organization type, the selection of organizations was made along with backup organizations in the event of scheduling issues or absence of EMS/SCADA/Real-time systems at the organization.

## **II.b Confidentiality and Anonymity Concerns**

The results of the first on-site reviews (Phase 1) clearly showed that once the initial concerns of the organizations in the sample regarding the objectives of the on-site review had been allayed (particularly confidentiality issues), the organizations were glad to have their Y2k programs reviewed. The information obtained by the organizations in these reviews proved to be useful in improving or validating their Y2k programs.

After the on-site review was concluded, and the organization was given a rating of Y2k Ready for all mission-critical systems by June 30, 1999, it was not uncommon for the organization to ask if it could make the information public.

In this Phase of on-site reviews (Phase 2), the organizations were much further along in completing their Y2k work, and the majority welcomed the opportunity to have their EMS/SCADA and Distributed Control Systems (DCS) reviewed by the on-site review team.

Some of the concerns that surfaced during the Phase 1 on-site reviews were still apparent.

1. Would the identity of the review participants be protected?
2. If an organization did not fare well in the audit, would it be singled out in the report to DOE?
3. Would specific information about the participants that may be considered confidential be included in the report to DOE?

To address these confidentiality concerns, a letter was written by the President of NERC, posted on the NERC web site, and sent to APPA and NRECA, so they could address these concerns with their members. A copy of the letter is included in Exhibit II. The letter was used by the review team as part of the initial contact with the sample organizations.

Based on the work of APPA and NRECA during the Phase 1 to address these concerns, it was easier to explain the purpose and objectives of the Phase 2 on-site reviews. Also, the report from Phase 1 had been posted on the NERC web site and had been reviewed by many in the industry.

As in Phase 1, all organization information used to determine the Y2k readiness status of EMS/SCADA and DCS systems was treated as confidential. No copies were made of these Y2k documents by the review team. No information was taken from the review site without permission of the organization being reviewed.



## **III Overview of On-Site Review Process**

### **III.a Scheduling/Staffing On-Site Reviews**

The point of contact at the selected organizations was the Y2k Project Manager. At some smaller organizations, this was the Chief Executive Officer. At the remaining organizations, most had an individual who assumed the Y2k Project Manager's role. Contact names at the organizations were supplied by APPA, NERC, and NRECA.

The functional Y2k Project Manager was contacted using the Telephone Call Form as a guideline to explain the project and to set up mutually agreeable dates for the on-site review. During the phone call the following items were discussed:

- Project objectives
- Confidentiality of all information
- Details of what information would be sent to them
- Possible review dates and what was required from them
- Y2k on-site review as a service to validate their Y2k project efforts for EMS/SCADA or DCS

### **III.b Information Packet**

After the on-site review dates were set, an information packet consisting of a confirmation letter, on-site review agenda, and Y2k information checklist was sent to the Y2k Project Manager. A copy of the NERC letter explaining the project also was sent, if requested by the Y2k Project Manager. E-mail was the preferred method for delivering this information.

A follow-up call was then made to verify that the information packet had been received, to answer any questions, and to discuss the testing in more detail. Based on the results of the initial on-site reviews, it was established that most organizations objected to sending their Y2k information to the review team beforehand, requiring the Y2k project documentation review take place on-site.

If the organization maintained a web site with Y2k information, it was reviewed prior to the on-site review. Most organizations were adding more specific information regarding their Y2k readiness on their web sites as they completed their Y2k work.

### **III.c On-Site Procedure**

Each on-site review followed a standard meeting agenda and started with introductions of the organization's Y2k project team, senior management who support the organization's Y2k efforts, and the on-site review team. The NERC/DOE project background, objectives, agenda topics, and estimated timeframes for scheduling on-site review items were discussed to ensure everyone had a good understanding of the review process and what was required of the organization's Y2k project team.

The review team and the organization representatives then agreed on a schedule for interviews and test reruns during the course of the review, to assure that relevant personnel and other necessary resources would be available without undue disruption to regular schedules and activities.

The organization's Y2k strategy was then reviewed to characterize and understand the structure employed by the organization for their Y2k projects, as it pertained to their EMS/SCADA or DCS systems. There are numerous strategies that can lead to a successful Y2k project; it was important for an organization to select a strategy for which they had the expertise and resources to support the project.

The review teams held discussions with the organizations' Y2k teams to determine the strategy they used to tackle the problem. The teams used the Y2k Readiness Strategy Checklist to lead and document the discussion. The checklist covered the following project areas:

- Awareness/Problem Definition
- Inventory
- Project Utility
- Assessment
- Remediation
- Testing
- Contingency Planning
- Y2k Customer Outreach Services
- Overall Elements
- Risk Management and Due Diligence

Within each of these categories, descriptive statements could be chosen by the project team to characterize the organization's Y2k strategy. The checklist served an important base, because the rest of the on-site review process flowed from it.

The next step was to compile Y2k project information for the EMS/SCADA or DCS portions. This step was accomplished using the "Y2k Electric System Readiness Assessment On-Site Review Document" (See Exhibit III), which contains 22 questions assessing the present status of the organization's Y2k project with an emphasis on the relevant control systems. Completing this document also facilitated in identifying the tactics implemented by the organization to support their Y2k strategy.

The introduction, Y2k strategy, and early readiness assessment generally involved the first morning of the on-site visit. These activities were accomplished in a group that included the entire on-site review team and the organization's Y2k project team responsible for the control systems. The organization's senior management rarely sat in on these sessions, but the decision to participate was left to them. The remainder of the on-site review investigated how well the information presented at that time was supported by the interviews, testing, and Y2k documentation.

The on-site review team also assessed the present Y2k project status and remaining Y2k project work as it pertained to their EMS/SCADA or DCS.

- Were there areas where outside resources could be of assistance?
- Could NERC be of further assistance?

- What were the Y2k project team's major Y2k concerns at that time?
- Did the concerns of the project team vary, or were they similar?

To conclude the first morning, the review team confirmed the tests to be rerun and the times and names for interviews. Because the tests of interest to the team were on mission-critical systems, it was difficult to schedule re-tests without interruptions of electric service. The review team was not always successful in setting up rerunning of tests on the EMS/SCADA and DCS systems.

In most cases, the DCS was controlling the generation system and could not be taken off line for testing without taking the generator off line. The DCS remediation and testing was accomplished during scheduled maintenance outages. A careful review of the testing procedures and results would have to suffice.

Testing of the EMS/SCADA systems fared better. This improved access was due to a number of the organizations that have redundant EMS/SCADA equipment typically used for testing, training, and software development. This equipment could be configured as a test bed for the Y2k test. Those organizations that did not have redundant equipment could not accommodate retesting. A few were able to accomplish some testing on backup EMS/SCADA systems that did not have full redundancy. The interviews and the testing were sometimes accomplished in parallel. All of the organizations were helpful and supportive in accommodating the requests of the on-site review team.

Next, the on-site review team examined the organization's Y2k project information. This work was divided among the review team members, depending on the amount of information. Typical documents and project files included:

- Y2k Project Plan and Schedule
- Inventory Tabulations
- Assessment Summaries and Research
- Project Budgets and Adjustments
- Remediation Tasks and Status
- Departmental Activity Reports
- Y2k Team Meeting Minutes
- Status Reports to Senior Management and Board
- Testing Methodology, Targets, and Results for EMS/SCADA and DCS Systems
- Communications with Key Suppliers and Customers
- Vendor Assurances and Testing
- Contingency Plans for Control Centers and EMS/SCADA and DCS Systems
- Internal or External Y2k Audit Reports
- Legal and Risk Assessments
- Overall Project Chronologies or Diaries
- Y2k Reports of Power Suppliers
- Staff Training Activities

The review of the Y2k project information required two to eight engineering hours depending on the size of the organization. This review was interspersed with related discussions, because the organization's Y2k project team was on-call to answer questions that arose.

After completing the Y2k review including the interviews and re-running tests, the on-site review team caucused to share information from all the on-site review elements, analyze the results, and develop conclusions as to the Y2k readiness of the organization's mission-critical EMS/SCADA or DCS systems.

Although considerable variation existed among sites due to organization size and complexity, the following timeline shows how a typical two-day session was conducted:

**Typical Time Devoted to  
Y2k Readiness On-Site Review Per Agenda Item**

	<i>Elapsed Time (Hours)</i>	<i>Review Team (Hours)</i>
1. Introduction – Welcome and Project Overview	1.5	3.0
2. Meet with Y2k Project Team – Strategies Deployed, Project Information, Statuses and Concerns	2.0	4.0
3. Y2k Project Review – Document and File Examination and Discussions with Y2k Team Members	4.0	6.0
4. Interviews with Control Center Support and Electric Operations Staffs	3.0	3.0
6. Analysis by the Review Team – Application of Review Criteria to Gather Results and Develop Conclusions	3.0	6.0
7. Meeting Wrap Up – Present Results to the Y2k Team and Senior Management, Answer Questions, and Suggest Next Action Items	1.5	3.0
<b>Totals</b>	<b>15.0</b>	<b>25.0</b>

Details of the testing forms and the EMS/SCADA and operational staff interview forms can be found in Exhibit III.

Listed below are discussions of different testing methods and the on-site review team's assessment of what constitutes acceptable levels of testing.

**Low-Level Testing**

A low-level test method would include testing of a very limited set of dates, such as the December 31, 1999 rollover to January 1, 2000, and implementing only a single power-on test for the date.

**Medium-Level Testing**

A medium-level test method tests devices for proper operation on the better-known potentially problematic date transitions, which include September 9–10, 1999, December 31, 1999 — January 1, 2000, and February 28–29, 2000. This

level of test method can also implement more than one test per date, such as a power-off rollover (when applicable) as well as a power-on rollover.

### High-Level Testing

A high-level test method tests devices for proper operation on a large set of dates<sup>1</sup>, which may include the following:

- September 9, 1999
- December 31, 1999
- January 1, 2000
- February 28, 2000
- February 29, 2000
- March 1, 2000
- December 31, 2000
- January 1, 2001

This level of test method also implements multiple tests per date, such as: reboot date retention test, power-on rollover, power-off rollover, and manual date set test.

The organizations in the sample utilized either the medium or high level test methods for testing of their EMS/SCADA and DCS systems, whichever the on-site review team deemed to be adequate.

#### Summary of Test Levels:

- No testing
- Low                      Small test date set, only power-on rollover
- Medium                Major dates tested and/or multiple tests per date
- High                    Large date set and multiple tests per date

The review team rated all of the project documentation discussed above, based on its completeness, the thoroughness of the responses from suppliers and vendors, and what was missing. Testing information was reviewed for written test procedures, completeness of testing procedures, and documentation of the testing results. Project procedures for tracking inventory and remediation and testing of mission-critical devices and systems were evaluated and rated. Project meeting minutes and project reports to management were rated based on the Y2k project plan and Y2k project strategy.

Interviews with key personnel were compared to see if there were contradictions between statements made by the interviewees and the Y2k project members. Were there Y2k concerns articulated in the interviews that were not covered by the organization's Y2k project? Lastly, the reviewers compared their notes with the project documents to ascertain if there were any discrepancies between the project documents and statements made by organization personnel during the on-site review.

Based on the above analysis and discussions, the review team would arrive at an initial rating of Level 1, 2, or 3 based on the evaluation criteria below. The review

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<sup>1</sup> Some organizations tested for the UNIX rollover date, January 19, 2038, as well. A number of them noted system problems during this test.

team would then develop a list of bullet items to support the evaluation. After discussion and agreement on the bullet items, a final determination was made to ensure the evaluation was supported by the proper factual information. Once final agreement was reached, the final evaluation was written up for discussion with the Y2k project manager. In addition, a list of observations regarding the Y2k program was compiled for discussion with the Y2k project team and senior management.

### **III.d Evaluation Criteria**

The evaluation criteria for the Y2k readiness assessment were:

Level 1: Organization is not likely to meet a readiness date of October 31, 1999 for EMS/SCADA/Real-time systems, and may not be Y2k Ready by December 31, 1999.

Level 2: Organization has some issues that cause concern for meeting a readiness date of October 31, 1999 for EMS/SCADA/Real-time systems, but should be Y2k Ready by December 31, 1999. There is a need to continue to monitor the organization's EMS/SCADA/Real-time progress.

Level 3: Organization should meet a readiness date of October 31, 1999 for EMS/SCADA/Real-time systems and will be Y2k Ready by December 31, 1999.

In applying the evaluation criteria, some judgments were required of the on-site review team. If there was a workaround to a Y2k problem that could be incorporated into the ongoing operations without invoking a contingency plan, the organization could be deemed a Level 3. These workarounds, for the most part, affected cosmetic issues, such as a wrong date on log, but did not affect the operational integrity of the device or system.

### **III.e Presentation of On-Site Review Results to Utility**

The on-site review team verbally presented their analysis and conclusions to the organization's Y2k Project Manager. These observations were offered to assist the organization in its Y2k efforts. Observations did not affect the review team's conclusion of the organization's Y2k readiness status. Observations usually addressed project documentation, coordination, contingency planning efforts, testing, vendor assertions of Y2k readiness, and supplier verifications.

The Y2k Project Manager had an opportunity to rebut or clarify the review team's analysis and conclusions. Based on the outcome of the meeting, the Y2k Readiness Evaluation of EMS/SCADA/Real-time, with supporting information, was completed for signature by the Y2k Project Manager and the review team. The Y2k Project Manager kept a copy of the Y2k Readiness Evaluation of EMS/SCADA/Real-time for its organization's files.

The results of the on-site review were then presented in a wrap-up session to the organization's Y2k project team and senior management. The Y2k Readiness Evaluation of EMS/SCADA/Real-time (see Exhibit II) was presented along with the supporting statements that were in the form of bullet items on the evaluation sheet. A question and answer session followed, and any remaining actions were detailed. This last step completed the on-site review process.

### **III.f Additional On-Site Review Documentation**

In addition to the documents discussed earlier, the on-site review team completed the following documents: (see Exhibit II)

- Profile of Utility
- Interview Forms
- Testing Results

These items were important documents that assisted in capturing information about the Y2k on-site review and helped characterize in more detail the organization and the people directly responsible for “keeping the lights on.” These documents provided additional information needed to complete the project report. The testing results gave a good indication of the process used to test and verify Y2k systems and devices, such as:

- Were written procedures used and followed?
- Were test verifiers and the Y2k Project Manager required to sign off on test results?
- Which Y2k dates were tested?
- How was the testing done: on line, off line, in a test bed configuration?
- Did vendors assist in the Y2k testing?
- Were vendors' assertions of Y2k readiness used in lieu of testing?

## **IV Procedures and Practices for EMS/SCADA and DCS Y2k Project Phases**

There were common features in the Y2k projects of all the organizations visited during Phase 2. The larger the organization, the more likely it would rely on resources other than the project team for quality control. This reliance included internal and external auditing of the Y2k project. On the other hand, the scope of the project varied greatly between large and small organizations. For example, a small organization may have only a few items in the Y2k inventory, and a large organization may have many thousands of items in the Y2k inventory. In general, EMS/SCADA systems and DCS systems were always mission-critical systems within the overall framework of the Y2k project. Some larger organizations treated the EMS/SCADA systems as mini Y2k projects within the overall Y2k project.

Y2k project stages followed conventional methods that sometimes changed slightly in order or in name, but remained similar in practices and procedures. The strategies deployed and results achieved, within each of these stages tell the readiness "story" for each organization. For purposes of this report, the stages are as follows:

1. Inventory
2. Assessment
3. Remediation and testing
4. Quality control
5. Contingency planning
6. Suppliers
7. Customer outreach programs

The definitions of the procedures and practices as they pertain to EMS/SCADA and DCS systems are given below:

### **IV.a Inventory**

To ensure reliable electric service through the Year 2000, the first step is to conduct an inventory of devices or systems that are both service critical and microprocessor based. The EMS/SCADA and DCS systems are two of the most important mission-critical systems for keeping the lights on during the millennium changeover. Inventory information for these systems came from inventory databases and Subject Matter Experts (SME) on the staff of the appropriate departments, and was confirmed by walk throughs of the systems. The more specific the inventory, the better the chance of obtaining helpful vendor information and cross checking with other organizations with similar systems. A thorough inventory will collect total number, vendor name, model number, version number and, if possible, manufacturer date and serial number of devices. EMS/SCADA systems contain hardware and software from a number of different vendors that must be tracked. DCS systems have a single vendor for the systems.



## **IV.b Assessment**

The second step for ensuring reliable electric service through Y2k is assessing the severity of the Year 2000 problem for an organization and the organization's ability to "keep the lights on," and to maintain communications with the organization's customers. Vendors were contacted for compliance information, including compliance statements, test procedures, and test verification steps for the inventoried items.

## **IV.c Remediation and Testing**

Answering the questions of what prudent actions should be taken to deal with compliance issues and to raise confidence in the critical systems are elements of the third step, remediation and testing, respectively.

Remediation implements the project goals through specific steps that include:

- Communicating
- Fixing, repairing, and remediating
- Device/system upgrading or replacement
- Mitigating, coping
- Retesting

Performing verification testing or obtaining results from a reliable third party will be necessary especially for critical systems such as EMS/SCADA systems, which are composed of hardware and software from a variety of vendors. These systems often have software programs that are unique to the particular organization. The reviewers' testing should verify vendor and the organization's results and check for system interrelationships of date handling.

Testing at the subsystem level, such as the EMS/SCADA computer operating system, may be needed early in a Year 2000 program, and again at a system-level once fixes have been completed.

Remediation and testing of EMS/SCADA and DCS systems require close cooperation between system vendors and ongoing operations, because these systems are critical to operations and are not easily taken out of service for remediation and testing. DCS remediation and testing must be coordinated with maintenance outages on the generators they support. This cooperation requires a close working relationship with the vendors of the DCS to have all necessary upgrades available for the maintenance outage. The EMS/SCADA systems require the same close cooperation with the vendor of the system, as well as the computer vendors, telecommunication providers, and other suppliers of system equipment. Most initial testing of EMS/SCADA systems was accomplished using off-line systems that are used for operator training and system development. Some organizations without development or operator training systems used the backup EMS/SCADA system for testing.

## **IV.d Quality Control**

Ensuring that the Y2k project receives the necessary oversight to certify that the methods and results conform to industry standards and practices for similar

projects requires an independent quality group inside and/or outside the company.

It was common to find that there had been previous independent verification and validation reviews of many of the selected organizations. It was more common to have external reviews than internal reviews.

#### **IV.e Contingency Planning**

Planning for contingencies requires one to ask, "what if things go wrong?" Contingency planning covers:

- Staffing for key dates
- Problem identification training
- Preparations for the transition into Year 2000, work-arounds, and other alternatives
- Supplier communications
- Customer contacts
- Staff communications
- Public communications
- Follow-up verification that systems work as expected following the critical date transitions and additional remediation

#### **IV.f Suppliers**

Year 2000 solutions are a matter of readiness for all of the electric power organizations because of the interdependency of distribution, transmission, generation, and other suppliers. Although individual hardware and software components may be deemed 100% compliant, an organization by its nature can only achieve a high state of readiness in conjunction with its suppliers and its neighboring organizations. Organizations have programs to determine and track the Y2k readiness of their critical suppliers, and the ability of these suppliers to supply goods and services to the organization during critical Y2k transition periods. Most organizations have also taken into account possible problems with critical suppliers as part of their contingency planning. These contingencies can range from ordering extra inventory to contacting alternative suppliers.

#### **IV.g Customer Outreach Programs**

All organizations have programs to keep customers and the public informed about their Y2k efforts. Smaller organizations usually use the organization manager as the focus for these efforts with help from the organization staff. Larger organizations use the Y2k project teams as the focus with assistance from the organizations' public relations departments. These efforts become more important as the organizations reach Y2k readiness and want to inform their customers and media. It is important that the electric industry continue to inform the public of the Y2k readiness of the industry during the remaining time before the Year 2000 transition to counter any remaining concerns about the industry's ability to keep the lights on.

## **V Summary of On-Site Review Results**

### **V.a Composite Entities**

To protect the confidentiality of the Y2k information supplied to the review team during the Phase 2 on-site reviews, the results are reported on an aggregated basis in this report. In addition, the individual organization reports resulting from the on-site reviews are presented in Exhibit IV in a manner that does not disclose the identities of the organizations.

The results are reported for the following categories of entities reviewed:

- Public Power Organizations (Municipals, Joint Action Agencies, and Federal)
- Electric Cooperatives (Distribution and Generation & Transmission)
- Investor Owned Utilities
- Independent Power Producers

These groupings are derived from the sample selection as described in Section II of this report.

### **V.b Public Power Organizations**

There were 160 Public Power organizations in the sample of 417 organizations from which the 20 on-site review organizations were selected. All were among the top 1,000 public power systems by number of customers, annual energy sales, or dollar revenue. Many in this group report directly to NERC on a monthly basis and are considered bulk electric entities. This group represents a large portion of public power customers, sales, and revenue but constitutes less than 10% of the public power entities across the country. This group is most likely to have and depend on an EMS/SCADA system compared to the smaller public power systems.

The systems are likely to have their own generation, but for the most part still purchase some of their power from others. If they have generation that runs on a regular basis, it is commonly sold to the wholesale power supplier as part of a power supply pool.

The public power systems in the sample ranged in size from 30,000 customers to over 343,000 customers. They serve mid-sized towns and communities across the United States. Their peak demands are between 210 MW and 2,428 MW. Federally owned organizations are also represented in this group.

The governance of these public power organizations varies. Most commonly, the municipal superintendent reports to the city manager, mayor, or an organization commission appointed by the city council.

A number of the municipals support more than just electric services for the city. The other services that they are often responsible for include water and wastewater. There is usually a common infrastructure for all customer services, such as billing and new accounts.

### **V.c Rural Electric Cooperatives**

Most electric cooperatives came into being during the 1930s to bring electricity to rural America. In the electric cooperative model, retail customers are served by the distribution cooperatives. The generation and transmission cooperatives (G&Ts) are responsible for generation, purchase, and transmission of power for their distribution cooperative members.

Many distribution cooperatives own the generation and transmission cooperatives. Some distribution cooperatives, however, are not affiliated with G&Ts and have alternate arrangements for delivery of wholesale electric power. Distribution cooperatives that are members of a G&T typically have seats on the board of the G&T.

A typical distribution cooperative is owned by its retail customers. These customers elect the cooperative's board of directors from among the membership. The chief executive or general manager of the distribution cooperative reports to the board of directors of the cooperative. Cooperatives are not-for-profit organizations.

There are about 850 electric distribution cooperatives operating in 46 states. They range in size from less than 500 customers to nearly 150,000 customers. Customer service areas are much larger than the public power systems reviewed, because the cooperative service areas are usually less densely populated. The electric distribution cooperatives selected for the on-site reviews range in size from 128,000 to over 140,000 customers. Distribution cooperatives typically have no generation and are dependent on their G&T cooperative to supply power to them. In general, the distribution cooperatives' demands are much more residential and farming than those of the public power systems.

### **V.d Investor Owned Utilities**

Investor owned utilities (IOUs) are responsible for the vast majority of power that is generated, transmitted, and distributed in the United States (about 75%). IOUs may be fewer in number, but they are much larger than most municipals and cooperatives. They also vary greatly in size from 100,000 to over three million customers. They can have compact territories or cover large geographical areas.

As the name implies, IOUs are owned by shareholders of publicly traded stocks. Most own generation, transmission, and distribution resources. This is changing as deregulation results in divestiture of generation and transmission assets and regional coordinators emerge to operate electric systems. Deregulation is also creating a large number of mergers and acquisitions among the IOUs, as they look for economies of scale to compete in the new deregulated market.

With respect to Y2k, most IOUs reported directly to NERC on a monthly basis, because they own and operate major generation and transmission facilities, i.e. portions of the bulk electric system.

The five IOUs selected for on-site review ranged in size from about 400,000 customers to over two million customers. Their service areas can be compact or quite large. They serve the majority of the densely populated areas, which typically have large commercial and industrial demands. Peak demands range between 1,900 MW and 20,000 MW. Most are summer peaking.

IOUs have two types of substations — transmission and distribution. Most have generation that is transmitted to their distribution substations and, ultimately, their retail customers. The number of substations in the study's sample of IOUs ranges from about 20 to 1,000.

## V.e Independent Power Producers

With deregulation, the role of independent power producers (IPPs) has continued to increase as they build new generation or buy the existing generation facilities. IPPs represent a growing portion of the power generation in North America. IPPs vary in size from small companies to large multinational companies.

## V.f On-Site Review Results

The table below lists the results for the 20 on-site reviews.

### Y2k Readiness Evaluations of 20 Electric Power Organizations

<i>Level 1</i> <sup>1</sup>	<i>Level 2</i> <sup>2</sup>	<i>Level 3</i> <sup>3</sup>
Not Y2k Ready by December 31, 1999	Y2k Ready by December 31, 1999	Y2k Ready by October 31, 1999
0	1	19

The on-site review team determined that all 20 of the organizations visited are very likely to be Y2k Ready prior to the year-end transition. Nineteen of the organizations were determined to be Y2k Ready by October 31, 1999. The remaining organization demonstrated a high probability of being Y2k Ready prior to the Year 2000. In this case, the remaining remediation was scheduled to be completed by November 1, but was rescheduled to accommodate personnel training. It will be completed by November 30. This delay poses no serious threat to being

<sup>1</sup> The entity is not likely to meet the Y2k readiness date (October 31, 1999), and may not be Y2k Ready by December 31, 1999.

<sup>2</sup> The entity has some issues that cause concern for meeting Y2k readiness date (October 31, 1999), but should be Y2k Ready by December 31, 1999. There is a need to continue to monitor the company's progress.

<sup>3</sup> The entity should meet Y2k readiness date (October 31, 1999) and will be Y2k Ready by December 31, 1999.

Y2k Ready by year-end. A follow-up call to the organization confirmed that the work has been completed, and the organization is now Y2k ready.

The following general conclusions were made as a result of the on-site visits:

- The organizations visited had applied the necessary resources (both staff and money) to their Y2k projects to address the Y2k issue as related to delivery of reliable electric power. These organizations exhibited a sense of urgency for the Y2k issue. Funding was not a major limitation in addressing Y2k at any of the organizations visited. Whether it was hiring consultants, repairing or replacing devices, components, or software, the necessary funds were made available. There were instances in which it was decided, based on economic considerations, to use a workaround to resolve a Y2k problem, instead of spending more dollars to repair or replace the item.
- All organizations by the date of the visits expressed a high degree of confidence in their Y2k readiness. All were proud of their efforts and many wanted to “show off” all that they had done.
- The organizations all recognized early in the process the mission-critical nature of their EMS/SCADA/DCS systems and took early steps to assess, prioritize, and remediate any problems. In several cases, the early attention proved to be the single most important factor in meeting the industry deadlines and year-end readiness.
- There were no known geographic differences encountered in the project. The level of effort was consistent across the continent.

#### **V.g General Observations of EMS/SCADA/DCS System Readiness**

The following captures some general observations of the review team:

- The vendor delays that affected the results of the Phase 1 on-site reviews were no longer an issue.
- Final EMS/SCADA vendor signoff was missing at some organizations, though in some cases receiving the signoff was prompted by the Review Team visit. Larger organizations generally had the vendor signoff much earlier than the visit. All organizations tested the EMS/SCADA system, regardless of the vendor compliance statement.
- As part of their contingency plans, the sample organizations frequently rely on manual EMS/SCADA operations even if the organization is declared Y2k Ready. Their contingency plan

usually means positioning people in substations to provide critical substation information.

## **V.h Public Power Organizations**

All public power organizations (municipal, state, and federal) received a rating of Level 3 (Y2k Ready by October 31, 1999) for their EMS/SCADA systems. Most of their EMS/SCADA systems were also ready by the industry deadline of June 30 with the exception of two vendor delays that ran into the third quarter of 1999. In one of these cases, remediation was delayed and in the other a replacement EMS/SCADA system delivery was delayed until early October.

Overall, public power systems reviewed showed a high degree of readiness especially with municipal systems showing citywide readiness and contingency preparations.

## **V.i Rural Electric Cooperatives**

All of the distribution cooperatives visited received Level 3 ratings (Y2k Ready by October 31, 1999) for their EMS/SCADA systems. Their readiness reflected the early attention given to EMS/SCADA systems and suitable vendor response received by the entire sample. This vendor response again points out that the EMS/SCADA vendors had been able to bring the necessary resources to bear on the needed Y2k remediation work since the Phase 1 on-site reviews.

## **V.j Investor Owned Utilities**

All of the IOUs visited also received Level 3 ratings (Y2k Ready by October 31, 1999) for their EMS/SCADA system. The IOUs were observed to have been working on the Y2k issue for a long time and able to complete the work necessary to remediate their Y2k mission critical EMS/SCADA systems. In general, the Y2k strategies used by the IOUs were similar giving early attention to EMS/SCADA systems and receiving suitable and timely responses from their vendors.

## **V.k Independent Power Producers**

Two of the Independent Power Producers (IPPs) were rated Level 3 (Y2k Ready by October 31, 1999). One was rated Level 2 (Y2k Ready by December 31, 1999) because of some final Y2k remediation of its Distributed Control System (DCS) could not be completed until the end of November. Because this work is under the control of the IPP, no problem is expected in meeting the December 31, 1999 date for Y2k readiness. As noted earlier, a follow-up call to the IPP confirmed the work has been completed, and the IPP is now Y2k Ready.

## VI Comparison of On-Site Reviews and Self-Reports to NERC, APPA, and NRECA

As was done in Phase 1, it is important to compare the results of the on-site review team and the organizations' self-reports to NERC, APPA, and NRECA. Fourteen of the 20 organizations in the Phase 2 sample reported to NERC. The remaining organizations reported to APPA and NERC. Some organizations may have reported to multiple agencies.

To understand this comparison, it is first necessary to understand the differences between the ratings produced by this review and those produced by the self-reporting process.

This review assigned each organization in the sample one of three ratings:

*Level 1:* Organization is not likely to meet a readiness date of October 31, 1999 for EMS/SCADA/Real-time systems, and may not be Y2k Ready by December 31, 1999.

*Level 2:* Organization has some issues that cause concern for meeting a readiness date of October 31, 1999 for EMS/SCADA/Real-time systems, but should be Y2k Ready by December 31, 1999. There is a need to continue to monitor the organization's EMS/SCADA/Real-time progress.

*Level 3:* Organization should meet a readiness date of October 31, 1999 for EMS/SCADA/Real-time systems and will be Y2k Ready by December 31, 1999.

The self-reporting process also produced three ratings:

*Y2k Ready* — The organization reports that it has completed its Y2k readiness process by June 30, 1999.

*Y2k Ready With Limited Exceptions* — The organization reports that it has completed its Y2k readiness process by June 30, 1999 except for a few specific items, whose remediation efforts are known and scheduled and the work completed by December 1999. These items typically involve issues such as vendor availability or the need to wait for a scheduled planned maintenance outage before the work can be completed.

*Not Y2k Ready* — The organization reports that it has not completed its Y2k readiness process by June 30, 1999.

- The on-site review was strict in its critique of mission-critical systems (EMS/SCADA and DCS systems) before assigning a Level 3. The only exceptions allowed pertained to workarounds that caused the Y2k problem to become a cosmetic issue, such as a wrong date on a log, but did not affect the operational integrity of the system.
- With some notable exceptions, such as the Limited Exceptions criteria, the self-reporting process involved both self-assessment and self-interpretation of definitions and other criteria. The on-site reviews used a common set of criteria across all the reviews and did not consider the individual organization self-interpretations. As it turned out, some



organizations took a more strict interpretation of Y2k readiness, where even a wrong date on a log would be considered not Y2k Ready.

- An additional aspect of this comparison was that the review did not have full access to all information provided by the organizations in the self-reporting process.

## **VI.a Municipals (Public Power)**

APPA provided a limited summary of the responses of the sampled municipals. There were two sets of data, a March 1999 survey (indicated as covering only systems with more than 3,000 meters), and a June 1999 survey that addressed only those systems that did not report being Y2k Ready in earlier surveys.

The summary included data from six of the municipals sampled in the review. There were some issues and discrepancies in the contents of the summary itself.

- The summary provided only a limited subset of the survey data in tabular form without any of the narrative explanatory comments that may have been included with the surveys.
- Because the June survey only included municipals that had not reported 100% completion in the March survey, it was not possible for a municipal to report remaining work on issues that may have arisen since the March survey.

With a few exceptions, the readiness data was reasonably correlated with the findings of the review.

## **VI.b Rural Electric Cooperatives**

NRECA also provided a limited summary of the self-reported data for the cooperatives in the sample. All of the cooperatives had been determined by the on-site review to be at Level 3. The cooperatives had reported to NRECA that their EMS/SCADA systems were Y2k Ready by October 31, 1999. This matches with the results of the on-site review.

The other data in the NRECA summary posed similar issues to the APPA summary involving codes, definitions, accuracy, and completeness.

## **VI.c IOUs/Federal Agency**

NERC provided information from the latest NERC surveys that was self-reported by the five IOUs and the one Federal Agency in the sample for EMS/SCADA systems. The Y2k readiness data self-reported by the IOUs and the Federal Agency was in agreement with the data determined by the on-site reviews.

## **VI.d IPPs**

Two of the three IPPs reported on a continuous basis to NERC. Of those two IPPs, one stated it was Y2k Ready With Limited Exceptions, specifically a DCS system that was to be Y2k Ready by the end of October, but would now be delayed until the end of November. The other stated it had no exceptions for all of its DCS systems within North America.

## **VI.e Summary**

As was shown by the Phase 1 on-site reviews, the electric industry is conservative in reporting their Y2k status. A number of Phase 1 organizations had reported that they were not ready by June 30, 1999, because of remediation work that remained on some systems, even though these business systems were not mission critical for keeping the lights on.

The self reported information is reasonably consistent with the Phase 1 and 2 on-site review information.

## VII Conclusions and Recommendations

### VII.a Conclusions

The overall results of the Phase 2 on-site reviews were reassuring. It showed continual progress by all the organizations in the sample in becoming Y2k Ready. All the organizations in the sample are now refining their contingency plans and drilling on the contingency plans.

EMS/SCADA and DCS systems, which are critical systems for keeping the lights on, will be ready at electric organizations for the Year 2000 transition. A random sample of 20 electric organizations revealed mission-critical readiness to be achieved by the end of October 1999, by all organizations but one, regardless of the size, location, and ownership type. Ninety five percent (19 out of 20 organizations) of the sample organizations were rated at the highest level, Level 3: *The entity should meet a readiness date of October 31, 1999 for EMS/SCADA/Real-time systems and will be Y2k Ready by December 31, 1999.* The remaining 5% (one organization) was rated a Level 2: *The entity has some issues that cause concern for meeting a readiness date of October 31, 1999 for EMS/SCADA/Real-time systems, but should be Y2k Ready by December 31, 1999. There is a need to monitor the organization's EMS/SCADA/Real-time progress.*

In all cases, the Y2k programs at the sample organizations were well under control and mission-critical readiness had been achieved by June 30, 1999 for the majority of the reviewed organizations. None of the organizations reviewed were rated at the lowest level, Level 1, *The entity is not likely to meet a readiness date of October 31, 1999 for EMS/SCADA/Real-time systems, and may not be Y2k Ready by December 31, 1999.* In fact, none of the organizations reviewed came close to Level 1, which is reassuring for the entire electric organization industry because the sample was randomly selected.

The validity of the sample is further supported by the fact that all the organizations contacted willingly participated in the evaluation. Although the organizations were free to refuse the program of independent evaluation, none of them chose to do so. Rather, they were eager to receive an outside review, support a NERC directed national program, and cooperate with their trade associations' (NRECA and APPA) endorsement. Furthermore, all supported the self-reporting process directed by NERC and supported by APPA and NRECA, and all were willing to participate in a process to verify and expand on this self-reporting by independent reviewers.

The only organization in the sample that did not meet the October 31, 1999 date for EMS/SCADA and DCS systems, decided to delay the final remediation and testing of a mission-critical system because of training conflicts with the person needed to complete the remediation and testing work.

All the participating organizations are to be commended for their willingness to participate and their openness during the independent evaluation. In no cases did the review team find obstructions to the review process or unwillingness of a organization or individual to participate and provide specific details about its programs. On the contrary, often times the review team was swamped with massive amounts of information and large numbers of people with whom to speak. The on-site review demanded a high degree of cooperation and flexibility

on the part of the participating organization. Each organization visited had to rearrange schedules, give up valuable staff time, or otherwise incur costs to accommodate the review team on relatively limited notice and subject themselves to "audit" conditions. All felt a sense of duty and intrinsic gain from participating in the program that led to full cooperation.

During the course of evaluations, the review team found it easy to make the decision that the company did or did not meet the October 31, 1999 date. The project findings for Phase 2 clearly demonstrate that the EMS/SCADA vendors have not caused continuing delays in meeting Y2k readiness, as was the case in the Phase 1 review.

The traditional Y2k program steps of inventory, assessment, remediation, and testing, fosters increased readiness within the organization. The organization's documentation of these steps aided the reviewers in judging the organization's readiness and ability to "keep the lights on." By the end of the review process, the reviewers gained insights on the state of readiness of the electric industry, organizations across the nation, and each organization visited gained valuable observations to improve or otherwise "button up" their programs.

In the final analysis, the reviewers concluded this Phase of audits further supports the findings from Phase 1 that indicated the electric organization industry is ready for the Year 2000 transition, regardless of size, location, or ownership type. Although it may be said that there may be isolated cases where organizations are not totally prepared for the Year 2000 transition, the sample shows a very high degree of readiness across the industry.

Those organizations that have been reviewed show a high degree of commitment across the organization to solving a problem that has not been faced previously. Most of the Y2k project teams had to wear their everyday "hats" as well as the "Y2k hat," but did so willingly. There were no budgetary problems with replacement of systems found not to be Y2k Ready. The industry moved with great speed to investigate, remediate, and test its mission-critical EMS/SCADA and DCS systems.

## **VII.b Recommendations**

Emphasis can now be placed on having suitable contingency plans and proper training to ensure any problems that may occur during the Y2k transition will be addressed promptly. The NERC drills in April and September 1999 showed that existing contingency plans could be enhanced and that additional contingency plan training was appropriate. The drills were also vitally important in making the industry aware that back-up communications systems and training on these systems was needed to coordinate with the appropriate Regional security coordinator.

DOE, NERC, and trade associations can now concentrate on industry coordinated national efforts to support contingency planning coordination, key supplier deliveries, external services especially communications, and the setting up of information centers to coordinate information gathering and dissemination for the Y2k transition. These information centers will assist organizations in finding out what is happening in the rest of the world as the midnight hour marches across the world. If there are problems that manifest themselves in areas that reach the millennium before the U.S., there will be time to react before the Y2k transition reaches here. This "window of opportunity" will allow

organizations to find out “what’s happening elsewhere” during the transition without unnecessarily burdening the communications systems and obstructing any of the response systems. In addition, it will help to properly record power delivery disturbances during the transition with the necessary detail to allow after-the-fact analysis. The vast majority of these disturbances are likely to be non-Y2k related, and properly characterizing these events will be critical to evaluating the industry and individual organization performance.

As stated earlier in this report, the electric industry must continue to keep the general public and their customers informed of their Y2k status to keep public confidence high regarding the electric industry’s ability to keep the lights on during the Y2k transition.

The electric industry must complete the wrap up of their Y2k programs. This wrap up includes completing required documentation and filing project information in a central location with adequate detail on the form and format of the Y2k project. Y2k project plans should be updated to match the actual project work. It is important that the project documentation adequately reflects the project work.

## **Exhibit I**

### **Pre-Visit Documents**

1. Telephone Call Form to Make Appointment for On-Site Visit
2. On-Site Review Confirmation Letter
3. Y2K Readiness On-Site Review Agenda
4. Y2K Readiness On-Site Checklist

### Telephone Call Form to Make Appointment for On-Site Visit

Utility: \_\_\_\_\_  
Contact: \_\_\_\_\_  
Phone #: \_\_\_\_\_  
Targeted Dates: \_\_\_\_\_

Cite the call from the DOE Y2K readiness on site project review team.

Confirm he/she is the Y2K program manager and ask if they are aware of the project.


Explain the project objectives (completeness and validity of testing, readiness status compared to "self reported" data and presence of vendor support), and the SCADA/EMS focus (including the data and communications acquisition and communications chain from/to the RTU and control center) of the Phase II review.


- a. Confirm their organization owns and is operationally dependant upon a SCADA/EMS system.


- b. **If yes**, proceed with appointment process (Steps 4-9)
- c. **If no**, note the explanation (for the report) and thank them for their time taking the call.


4. Note that all information is confidential.
5. Outline how the review can be a service to them to validate their Y2K efforts.
6. Set the dates for visit and who to ask for upon arrival.


7. Tell them what will be sent to them (agenda, confirm letter, checklist).
8. Call them back or otherwise confirm they received the information, and ask if they have questions. At this time (or during the initial phone call) tell them we want to rerun at least two of their tests in some way connected to their SCADA/EMS system.


9. Note on this form any information gained about their SCADA/EMS systems.




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**Department of Energy  
Y2K On-Site Review Project**

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**[Date]**

**[Address]**

**Subject:** U.S. Department of Energy Y2K On-Site Readiness Review

Dear **[Name]**

Confirming our discussion and arrangements for your company's participation in the Department of Energy's Y2K On-site Readiness Review Project, we look forward to meeting with you and your Y2K project team starting on **[Date]** at **[Time]** at your facility located at **[Location]**. In addition to having persons who are directly involved with your company's Y2K efforts, it is important to have senior management, who are supporting your company's Y2K readiness efforts, present at the beginning of our meeting and at the wrap-up session. The focus of this meeting is on EMS/SCADA/Real-time systems and compliance.

I have attached an agenda for the meeting, but the actual course of the meeting may change based on our mutual findings. To further expedite the meeting and minimize the required time commitment by you and your team, please ensure that the program documentation that we discussed is made available at the meeting. The attached checklist notes the specific Y2K program information that we need to review, especially those items that pertain to EMS/SCADA/Real-time issues.

The **[Number]**-person team conducting this review will be **[Names]** from **[Company]**.

If there are any discrepancies in the above meeting arrangements or other questions or clarification required, please contact me by phone at **[Phone #]** or by email: **[e-mail]**.

Sincerely,

**[Name]**

DOE Project Team

Enclosures: Meeting Agenda  
Letter from NERC  
On-Site Checklist

## **Y2K Readiness On-Site Review Agenda**

The scope of a Phase II on-site review is on EMS, SCADA, and real-time control systems. This will center on the control room, master stations, and extend to RTUs in the field, but not beyond these boundaries. A review of other systems during the visit is in support of this primary objective.

### **Introduction**

- A. Welcome and Introductions**
- B. Review Project Objectives**
- C. Review Agenda and Times**
- D. Attend to Administrative Details**

### **Y2K Project Team Session**

- A. Review Company's Y2K Strategy**
- B. Collect Y2K Project Information**
- C. Discuss EMS/SCADA/Real-time Status/Concerns**

### **Y2K Project Review**

- A. Review Y2K Plan**
- B. Review Inventory, Remediation, and Other Results**
- C. Review Present Status**
- D. Review Project Schedule**
- E. Review Contingency Plans/Audits**
- F. Review Budget**
- G. Review Suppliers/Vendors' Assurances/Tests**

### **Planned Re-run of Tests**

- A. Select Test**
- B. Witness and Verify Results**

### **Interviews**

- A. EMS/SCADA/Real-time Operations**
- B. Electric Operations**
- C. Other (IT Manager, TeleComm, etc.)**

### **DOE Project Team Analysis**

- A. Discuss Analysis with Y2K Program Manager**
- B. Meet with Y2K Project Team**

**Meeting Wrap Up**

- A. Discuss Results of Y2K Review**
- B. Action Items**

**Y2K Readiness On-Site Check List**

The following list is indicative of the type of information that will be helpful if prepared prior to the meeting.

**DOCUMENTATION**

<input type="checkbox"/>	Completed NERC Surveys (if applicable) _____
<input type="checkbox"/>	Y2K Project Plan and Schedule _____
<input type="checkbox"/>	Y2K Inventory Lists _____
<input type="checkbox"/>	Project Budgets and Adjustments _____
<input type="checkbox"/>	Y2K Team Meeting Minutes _____
<input type="checkbox"/>	Y2K Contingency Plan _____
<input type="checkbox"/>	Y2K Plan Updates _____
<input type="checkbox"/>	Y2K Inventory _____
<input type="checkbox"/>	Y2K Remediation Tasks and Status _____
<input type="checkbox"/>	Y2K Testing Plans/Results _____
<input type="checkbox"/>	Reports made to Management/other agencies _____
<input type="checkbox"/>	Internal and External Audit Reports _____
<input type="checkbox"/>	Legal and Risk Assessments _____
<input type="checkbox"/>	Overall Project Chronologies or Diaries _____
<input type="checkbox"/>	Y2K Reports of Power Suppliers _____
<input type="checkbox"/>	Staff Training Activities _____
<input type="checkbox"/>	Suppliers' Assurances for Y2K services/goods _____
<input type="checkbox"/>	Vendors' Assurances for Y2K readiness _____
<input type="checkbox"/>	Maintenance of Y2K Readiness _____
<input type="checkbox"/>	Other pertinent information _____

**TESTING**

Please consider a rerun of Y2K tests on SCADA/EMS/Real-time systems that we can witness during the visit.

	Name	Function	People Performing
Test 1:			
Test 2:			

**INTERVIEWS**

We would like to conduct group interviews with person(s) responsible for EMS/SCADA/Real-time systems and electric operations. These can be scheduled for the afternoon of the first day or the morning of the second day and will take approximately one hour to complete.

Group	Names	Time	Place
Group			

## **Exhibit II**

### **NERC Letter to Industry Regarding On-Site Reviews**



**MICHEHL R. GENT**  
President

## **NORTH AMERICAN ELECTRIC RELIABILITY COUNCIL**

Princeton Forrestal Village, 116-390 Village Boulevard, Princeton, New Jersey 08540-5731

September 16, 1999

TO: YEAR 2000 READINESS REVIEW PARTICIPANTS

### **U. S. Department of Energy Sponsored Independent Reviews of Year 2000 Programs**

The North American Electric Reliability Council (NERC), under the sponsorship of the U.S. Department of Energy (DOE), has conducted an independent review of Year 2000 (Y2k) programs at a random sample of electric power organizations in North America. Recently, DOE asked NERC to conduct additional independent reviews with emphasis on energy management and supervisory control and data acquisition systems. Your organization was randomly selected for a review, and we ask your support and cooperation with the review team in this effort.

The goal of this program is to validate the self-reporting process that NERC established to provide periodic reports to DOE on the Y2k status of the industry. This review process is not concerned with the readiness of any individual organization, but designed to gauge the overall readiness of the industry through a randomly selected sample.

A review team has been established and is in the process of scheduling and conducting on-site reviews. It consists of qualified independent contractors, who conducted the earlier reviews. In its assignment, the review team will use an outline developed from the NERC Y2k Readiness Assessment Report (this EXCEL spreadsheet is available on the NERC Y2k web site at <http://www.nerc.com/y2k>). The review process focuses on verifying information that would typically be reported to NERC or one of its trade association partners<sup>1</sup>.

Candidate organizations have been selected randomly from the over 3,000 organizations in North America that produce, transmit, or deliver electricity. By participating in this review, each selected organization is able to represent the status of Y2k readiness of that particular sector of the industry. The sample profile has been

Year 2000 Readiness Review Participants  
September 16, 1999  
Page Two

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<sup>1</sup> NERC is being assisted by the American Public Power Association, the Canadian Electricity Association, the Edison Electric Institute, and the National Rural Electric Cooperative Association.

carefully designed to assure representation of ownership types, size, geographic location, and other factors.

A summary report of the on-site reviews will be provided to DOE and the public in November 1999. **No utility organizations participating in the review will be identified by NERC or anyone affiliated with the review process.** The results will be identified as Utility A, B, C, etc. Also, each participating utility organization will be provided an opportunity to review the report to assure that sensitive information has been removed.

It is very important that each organization that is requested to participate does so. Any refusals to participate will be recorded as part of the review process. Refusals to participate will reflect negatively on the Y2k status of the electric power industry and weaken the validity of the NERC voluntary reporting process. You should know that all of the organizations that were asked to participate in previous reviews did so, and these reviews were conducted to the satisfaction of all parties involved.

As a benefit for participating, you will receive, at no cost, a detailed version of the on-site review report. This report is an external, independent assessment of your program.

Please cooperate fully with the Y2k readiness review team. In exchange, I will assure the confidentiality of the identity of each organization participating in the review process. If you have any further questions about the review process, please contact Terry Devaney at 408-532-7185 or [tdevaney@worldnet.att.net](mailto:tdevaney@worldnet.att.net).

Sincerely,

Michehl R. Gent

## **Exhibit III**

### **On-Site Review Documents**

1. Checklist for Utility Program Review (Y2K Readiness Strategies)
2. Y2K Electric System Readiness Assessment (On-Site Review Document)
3. EMS/SCADA/Real-Time Interview
4. Y2K On-Site Interview Form
5. DOE Y2K Readiness Evaluation
6. Profile of Organization Visited
7. Key People Participating in the Assessment



## A Checklist for Utility Program Review Y2K Readiness Strategies

This checklist of strategies is intended to be used by the DOE Y2K On-Site Review Team to characterize a utility's strategies in various areas for Y2K readiness. The checkmarks, or absence of them, are intended to simply record observations of the Team and do not imply recommendations or judgments of correctness. Many strategies can lead to Y2K readiness and are often selected considering a utility's situation.

(☒ = Major    ☑ = Minor)

### Awareness/Problem Definition

- ☐ Primarily resides elsewhere, outside of utility.
- ☐ One of public perception and reaction.
- ☐ Technical with computers, software and embedded systems.
- ☐ Communications in regard to regulators, customers and those who may bring legal changes.
- ☐ A business issue that could affect our well being.
- ☐ Societal that threatens social fabric – our utility has a role to maintain it.
- ☐ Very difficult to define and keeps changing in complexion as we approach the year 2000.

Comment:

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### Inventory of EMS/SCADA/Real-time Systems

- ☐ Count all business and operating equipment and leave any filtering to the assessment stage.
- ☐ Count all *electronic* business and operating equipment.
- ☐ Count all *critical* business and operating equipment whether electronic or not.
- ☐ Count all *electronic, microprocessor based, and calendar/clock* based equipment.
- ☐ Count all software wherever it resides.
- ☐ Count equipment and software whether it is *owned or not* if part of providing electric service or communications.
- ☐ Count only *utility owned* equipment and software equipment.

Comment:

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## Project Organization

- ☐ Centralized
- ☐ Top Management
  - ☐ Executive Sponsor
  - ☐ Y2K Coordinator reports to CEO or VP
  - ☐ Y2K Team centrally located and charged
  - ☐ Reporting through central Y2K office
  - ☐ Outside assistance reports centrally
- ☐ Decentralized
- ☐ Minimal central coordination, departmental or functional area driven.
  - ☐ Primary readiness responsibility rests with departments.
  - ☐ Y2K Team consists of departmental managers or staff.
  - ☐ Reporting originates and is approved at departmental level.
  - ☐ Outside assistance reports to department.
  - ☐ Y2K tasks of inventory assessment, testing, etc. rests with department.
- ☐ Mixed (some of each of the above, see checkmarks).

Comment:

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## Assessment

- ☐ Screen and prioritize inventory items by:
- ☐ Service criticality
  - ☐ Reliance on clock calendar
  - ☐ Interconnectedness/part of larger system
- ☐ Obtain compliance information:
- ☐ Letter campaign
  - ☐ Vendor websites
  - ☐ Industry databases
  - ☐ Other utilities/joint efforts
  - ☐ Self-checking and testing
- ☐ Determine problem severity:
- ☐ Service criticality
  - ☐ Estimated remediation cost
  - ☐ Lead time/resource constraints

- ☐ Interconnectedness of system
- ☐ Ownership/responsibility problems
- ☐ Use expert judgment:
  - ☐ Internal by area and expertise
  - ☐ External: ☐ Overall
  - ☐ Specialists:
- ☐ Product assessment deliverables:
  - ☐ Analysis report
  - ☐ Areas of attention directives
  - ☐ Product or services orders
  - ☐ Grading/prioritization of inventory list

Comment: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

## Remediation

- ☐ Doubt need, test specific performance.
  - Recognize minor issues but test to assure they do not cause significant problems.
- ☐ Develop work-around.
  - Avoid problem areas with change in procedure.
- ☐ Patch and fix.
  - Do just what is needed to get through.
- ☐ Upgrade.
  - Move to latest, higher version.
- ☐ Replace.
  - Use as reason to purchase new and gain additional benefits.
- ☐ Redesign system and work processes.

Comment: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

## Testing (overall or by area)

### Testing Targets

- ☐ Test all equipment and software.
- ☐ Test to substantiate vendor statements.
- ☐ Test those items with incomplete compliance information.
- ☐ Test representative field sample of devices.

- ☐ Test mission critical systems.
- ☐ Test as a means of assessment.
- ☐ Test after remediation as a means of verification and assurance.

Testing Methodology (by area or system)

Test for key dates:

- |  |   |  |
|--|---|--|
| <input type="checkbox"/> Major Dates                               | <input type="checkbox"/> Others                                 | <input type="checkbox"/> Comprehensive/All |
| <input type="checkbox"/> September 9, 1999 -<br>September 10, 1999 | <input type="checkbox"/> December 31, 2000 -<br>January 1, 2001 |  |
| <input type="checkbox"/> December 31, 1999 -<br>January 1, 2000    | <input type="checkbox"/> February 28, 2001 -<br>March 1, 2001   |  |
| <input type="checkbox"/> February 28, 2000 -<br>February 29, 2000  | <input type="checkbox"/> December 31, 2027 -<br>January 1, 2028 |  |
| <input type="checkbox"/> February 29, 2000<br>March 1, 2000        |   |  |

Transition approaches:

- ☐ Roll over Power on
- ☐ Roll over Power off/reset

Observation methods:

- ☐ Device/software display
- ☐ Transfer of date to other device
- ☐ Device/software key function during test

Test location:

- ☐ Lab bench or office at utility
- ☐ In the field
- ☐ Office/field/communications system

Test reliance:

- ☐ Utility itself
- ☐ Service/outside assistance
- ☐ Vendor personnel: ☐ On-site ☐ Vendor site
- ☐ Other tests by others of similar systems

## Y2K ELECTRIC SYSTEM READINESS ASSESSMENT

### On Site Review Document

**Fields in bold are considered mandatory**

<b>1. Review Date</b> _____	<b>2. Organization</b> _____
Address _____	

2a. Organization Type (Check the one that applies best)

- |                              |                               |                                     |
|------------------------------|-------------------------------|-------------------------------------|
| <input type="checkbox"/> G&T | <input type="checkbox"/> Fed  | <input type="checkbox"/> IOU        |
| <input type="checkbox"/> IPP | <input type="checkbox"/> Muni | <input type="checkbox"/> Rural Coop |

2b. Organization Functions?

- |  |                                       |                                     |
|--|---------------------------------------|-------------------------------------|
| <input type="checkbox"/> Control Area                  | <input type="checkbox"/> Transmission | <input type="checkbox"/> Generation |
| <input type="checkbox"/> Regional Security Coordinator | <input type="checkbox"/> Distribution | <input type="checkbox"/> Other      |

2c. Organization Size (Indicate the number of MW in each of the following categories for the utility covered by this report)?

<u>System Peak Load</u>	<u>Generation Capacity</u>	<u># of Meters</u>
-------------------------	----------------------------	--------------------

3. NERC Region \_\_\_\_\_

4a. Person in charge of Y2K Readiness Program  
(Y2K Ready means a system or application has been determined to be suitable for continued use into the Year 2000)

**Name:** \_\_\_\_\_  
**Title:** \_\_\_\_\_  
**Phone:** \_\_\_\_\_  
**Fax #:** \_\_\_\_\_  
**Email:** \_\_\_\_\_

4b. Names and titles of other Y2K project team members.

\_\_\_\_\_

4c. Names of EMS/SCADA/Real-time team members

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

5. Review of written materials for Y2K readiness.

- |   |                              |                             |                       |
|---|------------------------------|-----------------------------|-----------------------|
| ▪ Does the plan appear to be                              | <input type="checkbox"/> Yes | <input type="checkbox"/> No | If no, why not? _____ |
| ▪ Are the Y2K readiness dates reasonable?                 | <input type="checkbox"/> Yes | <input type="checkbox"/> No | If no, why not? _____ |
| ▪ Has the plan been updated to reflect present status?    | <input type="checkbox"/> Yes | <input type="checkbox"/> No | If no, why not? _____ |
| ▪ Is there a formal and sufficient plan review procedure? | <input type="checkbox"/> Yes | <input type="checkbox"/> No | If no, why not? _____ |
| ▪ Does the Y2K program budget seem sufficient?            | <input type="checkbox"/> Yes | <input type="checkbox"/> No | If no, why not? _____ |

Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**6a. Does the organization's Y2K Program report directly to a company officer? Yes**

Name & Title: \_\_\_\_\_

6b. Does the Board of Directors or governing body receive regular (at least quarterly) reports on the status of the Y2K Program? ☐ Yes ☐ No

7a. Identify the present overall status of Y2K Program for mission critical SCADA/EMS (DCS) and Telecommunication functions and applications:

i) Control center computer systems

Inventory \_\_\_\_\_  
Assessment \_\_\_\_\_  
Remediation/Testing \_\_\_\_\_

ii) Data acquisition subsystems

Inventory \_\_\_\_\_  
Assessment \_\_\_\_\_  
Remediation/Testing \_\_\_\_\_

iii) UPS systems

Inventory \_\_\_\_\_  
Assessment \_\_\_\_\_  
Remediation/Testing \_\_\_\_\_

iv) Backup control center

Inventory \_\_\_\_\_  
Assessment \_\_\_\_\_  
Remediation/Testing \_\_\_\_\_

v) Telephone switches and key systems?

Inventory \_\_\_\_\_  
Assessment \_\_\_\_\_  
Remediation/Testing \_\_\_\_\_

vi) Microwave systems?

Inventory \_\_\_\_\_  
Assessment \_\_\_\_\_  
Remediation/Testing \_\_\_\_\_

vii) SCADA radio?

Inventory \_\_\_\_\_  
Assessment \_\_\_\_\_  
Remediation/Testing \_\_\_\_\_

viii) Modems?

Inventory \_\_\_\_\_  
Assessment \_\_\_\_\_  
Remediation/Testing \_\_\_\_\_

ix) Fiber systems?

Inventory \_\_\_\_\_  
 Assessment \_\_\_\_\_  
 Remediation/Testing \_\_\_\_\_

x) Leased lines?

Inventory \_\_\_\_\_  
 Assessment \_\_\_\_\_  
 Remediation/Testing \_\_\_\_\_

xi) Power line carrier systems?

Inventory \_\_\_\_\_  
 Assessment \_\_\_\_\_  
 Remediation/Testing \_\_\_\_\_

xii) Satellite systems?

Inventory \_\_\_\_\_  
 Assessment \_\_\_\_\_  
 Remediation/Testing \_\_\_\_\_

7b. What method was used to determine the Y2K mission critical inventory?

\_\_\_\_\_

7c. What rationale was used to determine ranking of inventory (critical, non-critical etc.)?

\_\_\_\_\_

8a. Date organization will be Y2K ready for all mission critical functions: \_\_\_\_\_

8b. If this is not the original date, what was the original date? \_\_\_\_\_

9. Have all suppliers of goods and services that are essential to mission critical operations been contacted to determine their ability to supply during critical Y2K periods? This includes telecommunications, fuel, water, transportation, material supplies, etc. ☐ Yes ☐ No

10. Which suppliers, if any, will not give assurances there will be no disruption in goods and services?

\_\_\_\_\_  
 \_\_\_\_\_

11. For those suppliers that will not give assurances, is there a viable contingency plan?

☐ Yes \_\_\_\_\_ ☐ No \_\_\_\_\_

12a. Review status of Y2K operating contingency preparedness:

	% Complete	Date tested & drilled
▪ Y2K power supply plans	_____	_____
▪ Y2K restoration plans	_____	_____
▪ Y2K customer/supplier contacts	_____	_____
▪ Y2K special operating procedures & plans	_____	_____
▪ Y2K personnel staffing	_____	_____
▪ Y2K training	_____	_____

12b. Are the results of 12a. available to others? ☐ Yes ☐ No

A Year 2000 Readiness Disclosure

13a. Is there an independent review of your Y2K Program? ☐ Yes ☐ No

If yes, name of reviewing organization: \_\_\_\_\_

13b. Are these reviews submitted to Board of Directors/governing body?

☐ Yes \_\_\_\_\_ ☐ No \_\_\_\_\_

13c. How often are these reviews done? \_\_\_\_\_

14a. Have all testable mission critical functions and applications in the inventory been tested?

☐ Yes \_\_\_\_\_ ☐ No \_\_\_\_\_

If no, list those that have not been tested and status (attach organization's inventory list).

Functions & Applications:

Status:

_____	_____
_____	_____
_____	_____
_____	_____

14b. Has the readiness of mission critical functions and applications been accepted based on vendor and manufacturer assertions? ☐ Yes ☐ No

14c. Do the mission critical inventory and the test plans and test results match for each inventory item that needed remediation? ☐ Yes ☐ No

If no, what are the discrepancies?

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

14d. Has any inventory, remediation, or testing work been done by outside sources?

☐ Yes Company Name & Contact: \_\_\_\_\_  
☐ No

14e. What specific work was done by the outside sources? Be specific.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

15. Review of test plans/procedures/results that have been widely used to verify Y2K readiness for a sample of items in the inventory.

15a. Do test plans/procedures appear adequate and complete? ☐ Yes ☐ No

15b. Do the test results seem correct and complete? ☐ Yes ☐ No

If no, amplify why not. \_\_\_\_\_



**15c. Rerun of tests.**

Device/component/system name: \_\_\_\_\_  
Test description: \_\_\_\_\_  
Test results: \_\_\_\_\_  
Comments: \_\_\_\_\_

Device/component/system name: \_\_\_\_\_  
Test description: \_\_\_\_\_  
Test results: \_\_\_\_\_  
Comments: \_\_\_\_\_

16. Are there any exceptions to your stated Y2K completion dates? ☐ Yes ☐ No  
If so, what are they? Be specific: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

16a. What are the reasons for the exceptions? Be specific:  
\_\_\_\_\_  
\_\_\_\_\_

16b. What can be done to mitigate these exceptions?  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

17. Can outside resources help? ☐ Yes ☐ No  
How? High end infrastructure \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

18. Have you made the results of Y2K readiness available to your customers? ☐ Yes ☐ No  
If no, will it be made available at a future date? ☐ Yes ☐ No When? \_\_\_\_\_

19. Does organization have a Y2K web site? ☐ Yes ☐ No  
If so, what is the URL? \_\_\_\_\_

20. What are the Y2K Program Manager's major concerns?  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

21. What else can be done to assist the organization's Y2K efforts?  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

22. Interviews were conducted with the person(s) responsible for EMS/SCADA/Real-time systems and electric operations. Interview forms to be filled out for each interview.

Group	Names
Group	Names

- ☐ Test reporting:
- ☐ Lab notes
  - ☐ Summary document
  - ☐ Documented methodology
  - ☐ Test report
  - ☐ Certification credentials
  - ☐ Outside review/audit

Comment: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

### Contingency Planning

- ☐ Self-contained, "lights out" contingency
- ☐ Telecommunications contingencies
- ☐ Emergency preparedness coordination
- ☐ Critical load/public safety contingencies
- ☐ Business continuation contingencies
- ☐ Inclusion of drills and staff training
- ☐ Targeted systems contingencies
- ☐ Terrorist act contingencies
- ☐ Islanding/generation self-reliance contingencies
- ☐ Loss of supply (non-power) contingencies
- ☐ Public communications/customer relations contingencies
- ☐ Risk management contingencies
- ☐ Alternative "chain of command" contingencies
- ☐ Approval, acceptance, adoption
  - ☐ Utility Staff
  - ☐ Utility Management
  - ☐ Utility Board
  - ☐ Governmental/Regulatory
  - ☐ Regional Group
- ☐ Actual drill performance and stage training
- ☐ Reporting
  - ☐ Internal
    - ☐ Knowledge and discussions only – no report
    - ☐ For special group
    - ☐ For staff
    - ☐ For management/board
      - ☐ Knowledge and discussions only
  - ☐ External
    - ☐ Customers/public
    - ☐ Regulatory
    - ☐ Regional coordination
    - ☐ Special effects

Comment: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

### Overall Elements

- ☐ Strategy, attitude, and approach.
- ☐ Budgeting and cost management.
- ☐ Customer communications.
- ☐ Legal and risk management.
- ☐ Industry partnering and competition.
- ☐ Legislative and regulatory.
- ☐ Supplier management.
- ☐ Staff awareness and training.

Comment: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

### Risk Management and Due Diligence

- ☐ Risk analysis and management component of program
  - ☐ Insurance review
  - ☐ Risk management action steps
- ☐ Use of risk management tools
  - ☐ Team accountability
  - ☐ Documentation
    - ☐ Chronology/diary of events
    - ☐ Contacts/correspondence/notices
    - ☐ Completed planning report
    - ☐ Completed contingency plan
    - ☐ Key supplier/customer files
  - ☐ Alignment with industry activities (filings, drills, etc.)
  - ☐ Outside review

Comment: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Y2K On-Site EMS/SCADA  
Interview Form**

\*\*\*If multiple systems are involved, please use multiple copies of this form\*\*\*

- |                        |
|------------------------|
| 1. Organization: _____ |
| 2. Names: _____        |
| 3. Titles: _____       |
| 4. System: _____       |

5. Are you satisfied with the present status of your EMS/SCADA/Real-time data acquisition system? ☐ Yes ☐ No

If no, why not? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

6. Did you encounter a problem in making your EMS/SCADA/Real-time data acquisition system Y2K Ready? ☐ Yes ☐ No

If so, what was the nature of the problem? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

7. Which vendor was involved? \_\_\_\_\_

a. Date the fix/part was requested: \_\_\_\_\_  
\_\_\_\_\_

b. Date the fix/part is scheduled to be delivered: \_\_\_\_\_  
\_\_\_\_\_

c. Or the date it was delivered: \_\_\_\_\_  
\_\_\_\_\_

8. On what date will your EMS/SCADA/Real-time data acquisition system be Y2K Ready?

\_\_\_\_\_

9. Do you have a contingency plan for your EMS/SCADA/Real-time data acquisition system?

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Have you tested/drilled your EMS/SCADA/Real-time contingency plan? \_\_\_\_\_

10. Is this utility a control area for generation? (only possible if generation is owned)

11. What percentage of your RTUs was tested for Y2K readiness?

12. Are all of your RTUs from a single vendor? ☐ Yes ☐ No

If not, how many vendors? \_\_\_\_\_

13. Did you have trouble obtaining the desired response form your RTU vendor(s)?

☐ Yes ☐ No

If so, which ones? \_\_\_\_\_

14. Did you perform an integrated EMS/SCADA/Real-time to RTU Y2K Readiness test?

☐ Yes ☐ No

15. Does your EMS/SCADA/Real-time system have electronic links to corporate systems?

☐ Yes ☐ No

If so, were Y2K Readiness tests performed using those links?

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16. Does your EMS/SCADA/Real-time system have electronic communication links to other utilities? ☐ Yes ☐ No

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17. Have you conducted a "practice drill" with other utilities with which there is interdependence?  
☐ Yes ☐ No

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18. Do you have an alternate method to communicate with other key utilities?  
☐ Yes ☐ No

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19. Do you agree that the tests you are re-running are illustrative of your Y2K readiness in the EMS/SCADA/Real-time data acquisition system area?  
☐ Yes ☐ No

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**Y2K On-Site Interview  
Form**

- 
- |                        |
|------------------------|
| 1. Organization: _____ |
| 2. Names: _____        |
| 3. Titles: _____       |
- 

4. Are you satisfied with the present status of the Y2K program?

☐ Yes \_\_\_\_\_ ☐ No \_\_\_\_\_

If no, why not? \_\_\_\_\_

5. Do you believe the organization will be Y2K ready before year-end?

☐ Yes ☐ No Y2K Ready Date: \_\_\_\_\_

6. What are your concerns regarding the Y2K program?

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

7. Have you participated in the Y2K Testing?

☐ Yes \_\_\_\_\_ ☐ No \_\_\_\_\_

8. Are you comfortable with accepting vendors' assurances of Y2K readiness without testing?

☐ Yes \_\_\_\_\_ ☐ No \_\_\_\_\_ ☐ Somewhat \_\_\_\_\_

- 
9. Have you participated in the contingency planning?

☐ Yes \_\_\_\_\_ ☐ No \_\_\_\_\_

10. Have you reviewed and concurred with the contingency plans?

☐ Yes \_\_\_\_\_ ☐ No \_\_\_\_\_

If no, why not? \_\_\_\_\_

- 
11. Has contingency plan training been conducted?

☐ Yes \_\_\_\_\_ ☐ No \_\_\_\_\_ If no, when? \_\_\_\_\_

12. Have contingency plan drills been conducted?

☐ Yes \_\_\_\_\_ ☐ No \_\_\_\_\_ If no, when? \_\_\_\_\_

13. Are you confident that critical goods and services will be available during Y2K transition periods?

☐ Yes \_\_\_\_\_ ☐ No \_\_\_\_\_ ☐ Don't Know \_\_\_\_\_

If no, why not? \_\_\_\_\_





## Profile of Organization Visited

Site Number \_\_\_\_\_

The scope of a Phase II on-site review is on EMS, SCADA, and real-time control systems. This will center on the control room, master stations, and extend to RTUs in the field, but not beyond these boundaries. A review of other systems during the visit is in support of this primary objective.

### 1. Year 2000 Readiness

*Select Level 1, 2 or 3 from below (delete those that do not apply)*

**Based on the information gathered from the on-site review, the assessor is to make an evaluation of the organization's EMS/SCADA/Real-time systems ability to meet readiness dates for all mission critical functions. The assessor will assign an overall level of risk based on the following:**

- ☐ Level 1: Organization is not likely to meet a readiness date of 10/31/99 for EMS/SCADA/Real-time systems, and may not be Y2K ready by 12/31/99.
- ☐ Level 2: Organization has some issues that cause concern for meeting a readiness date of 10/31/99 for EMS/SCADA/Real-time systems, but should be Y2K ready by 12/31/99. There is a need to continue to monitor the organization's EMS/SCADA/Real-time progress.
- ☐ Level 3: Organization should meet a readiness date of 10/31/99 for EMS/SCADA/Real-time systems and will be Y2K ready by 12/31/99.

The assessors reached this conclusion based on the following insights:

- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_

## 2. Profile of Utility

### 2.1 General statistical information

Utility Type:	_____
Annual Gross Revenue (Year):	_____
Control Area	_____
System peak Load:	_____
Load Characteristics:	_____
Number of Customers	_____
Number of Residential Customers	_____
Number of Commercial Customers	_____
Number of Industrial Customers	_____
Number of Other Customers	_____
Number of Substations:	_____
Generation	_____

Owned and Operated - non nuclear	_____
Owned and Operated - nuclear	_____
Purchased Power & Sources	_____
System Characteristics	_____
Overhead Transmission	_____
KV/Circuit Miles	_____
Underground Transmission	_____
KV/Circuit Miles	_____
Overhead Distribution	_____
KV/Circuit Miles	_____
Underground Distribution	_____
KV/Circuit Miles	_____
Load Characteristics:	
Expected Load at Transition from	
1999 into year 2000	_____
Percent Self Generation	_____
	Source: Annual Report
	Electrical World Directory
	Web Page – <i>If available</i>
	Other - <i>specify</i> _____
URL to Web Page:	_____

## 2.2 Local Y2K environment

*(Include relevant information about the utility such as what fuel base is used for generation, black start capability, types of loads served by the utility, critical loads, dependence on power from others, degree of integration with other utilities etc.)*

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## 3. Year 2000 Readiness History

### 3.1 Start of Y2K preparation

*(When did the preparation begin and at whose initiative. What was the budget and personnel allocated to achieve Y2K readiness, key people in Y2K project with reporting – organization chart if available to be attached)*

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(Role of outside consultants and auditors)

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### 3.2 Assessment strategy for EMS/SCADA/Real-time

*(Inventory process or the method used to identify inventory – walk through, BOM combinations etc. Identification of all possible components, all digital or only the critical digital systems. Definition of critical (i.e., business critical or mission critical - keep the lights on)*

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*(Assessment strategy/testing- relied on vendor information, sample testing, simple testing – reduced data set etc.)*

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*(Critical supplier approach - Method used to identify critical suppliers; e.g. purchase records etc. (power suppliers, fuel suppliers, water suppliers, phone service, and other vendor strategy)*

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### 3.3 Test strategy and procedures for EMS/SCADA/Real-time

*(Risk based priority test strategy - highest business impact tests first and more comprehensive tests applied. Lower impact not tested at all or at a less detailed level or other strategies)*

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*(Testing procedures - Compliance assessment testing; test date and date transitions testing; Application tests; validation tests (of remediation work); Differentiation between large and complex systems and small, stand-alone systems with embedded chips; Integrated tests or unit tests; Test audits)*

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### 3.4 Remediation strategy for EMS/SCADA/Real-time

*(Fix or replace; in-house versus outsourcing; live with the problem and adjust settings manually; differentiation between large and complex systems and small stand-alone units)*

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### 3.5 Customer information and survey responses [Omitted for Phase II]

*(Active customer contacts to avoid irrational behavior of customers at the transition from year 1999 to 2000; response to requests for information on Y2K readiness from others such as local phone company, hospitals etc.)*

### 3.6 Quality control to ensure that Y2K readiness is achieved and maintained

*(Role of inside auditors; outside auditors, NERC test participation, procedures in place to ensure that readiness state is not lost as a result of warranty changes, upgrades etc.)*

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### 3.7 Contingency plans for EMS/SCADA/Real-time

*(Horizon for plan, trial of plan procedures, special staffing and manual controls at the transition, self-generation and special provisions to deal with large load swings, dependency on public communication systems and preparedness for phone system – including cellular system – overloads etc.)*

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## 4. Position of the Utility at Time of Assessment

### 4.1 General position on EMS/SCADA/Real-time

*(Progress on schedule towards Y2K readiness; budget spent versus projected, remaining work; criticality of this work; participation in April 9 NERC Exercise; opinions of auditors – if any etc.)*

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## 4.2 Review of plans and relevant documentation

*(Existence of documents; errors and omissions in documents; vendor/supplier readiness information etc.)*

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## 4.2 Review of test records

*(Existence of test procedures; test result documentation; completeness on testing to known problem dates, test procedures likely to catch the known problems; reliance on vendor information or actual testing of mission critical systems, use of test data from sources such as EPRI, other utilities or other organizations with relevant data etc.)*

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## 4.3 Retest of selected equipment/systems

*(Selection process – assessors allowed to select or utility selection, repeat of test generated, same results as when utility (or tester) did the test last time etc.)*

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## 5. Interviews

### 5.1 Interview #1 – *name and title of person interviewed*

*(Impressions from interview; concerns and or convictions and reasons for these)*

Title(s):

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### Interview #2 –

Title(s):

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### 5.3 Key Concerns of Utility Managers

*(Include anything that may be helpful in understanding the reasons for the concern)*

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## **6. Key People Participating in the Assessment**

### **6.1 Utility people (Titles only)**

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### **6.2 List of Attachments**

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## **7. EMS/SCADA/Real-time Comments**

### **7.1 Preparations**

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### **7.2 Vendor Responses**

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### **7.3 Testing**

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### **7.4 Sign-off/Certification**

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**Key People Participating in the Assessment  
(Full Names and Titles)**

**Utility people**

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**Assessors**

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## **Exhibit IV**

### **Completed Profiles of Organizations Visited**

# Profile of Organization Visited      Site Number: 1

## 1. Year 2000 Readiness

*Select Level 1, 2 or 3 from below (delete those that do not apply)*

**Based on the information gathered from the on-site review, the assessor is to make an evaluation of the organization's EMS/SCADA/Real-time systems ability to meet readiness dates for all mission-critical functions. The assessor will assign an overall level of risk based on the following:**

- ☒ Level 3:      Organization should meet a readiness date of 10/31/99 for EMS/SCADA/Real-time systems and will be Y2k ready by 12/31/99.

The assessors reached this conclusion based on the following insights:

- Mission-critical SCADA/EMS system is Y2k ready
- Limited availability of detailed test procedures and documented test results but SCADA/EMS readiness verified in sample test at time of review
- Clean Management procedures for SCADA/EMS put in place 9/30/99
- AGC tests in 1995 performed by an engineer who witnessed the tests and who will prepare a memo to that effect for the Y2k file
- Contingency plan needs to be updated and completed

## 2. Profile of Utility

### 2.1 General statistical information

Utility Type:	Transmission
Annual Gross Revenue (Year):	\$113M
Control Area	
System peakDemand:	2,100 MW
Demand Characteristics:	
Number of Customers	90
Number of Residential Customers	
Number of Commercial Customers	
Number of Industrial Customers	
Number of Other Customers	
Number of Substations:	24

### 2.2 Local Y2k environment

*(Include relevant information about the utility such as what fuel base is used for generation, black start capability, types of loads served by the utility, critical loads, dependence on power from others, degree of integration with other utilities etc.)*

- The utility markets power from generating plants owned and operated by a generating organization.
- The power is sold to municipal and cooperative utilities.
- The utility is integrated with a number of other regional utilities.

### 3. Year 2000 Readiness History

#### 3.1 Start of Y2k preparation

*(When did the preparation begin and at whose initiative. What was the budget and personnel allocated to achieve Y2k readiness, key people in Y2k project with reporting – organization chart if available to be attached)*

- Y2k issues were addressed very early in the mid-90s when a new SCADA/EMS system was procured. Internal efforts that focused on embedded systems were informally initiated in 1996. The formal effort was put in place late 1997.
- A Y2k team was established in January 1998, to address equipment readiness issues. Another group given the task of developing contingency plans was formed later.

*(Role of outside consultants and auditors)*

- A firm was engaged to do an independent verification and validation of the Y2k effort.
- Financial auditing firm will perform its audit early November 1999.

#### 3.2 Assessment strategy for EMS/SCADA/Real-time

*(Inventory process or the method used to identify inventory – walk through, BOM combinations etc. Identification of all possible components, all digital or only the critical digital systems. Definition of critical (i.e., business critical or mission critical - keep the lights on)*

- Databases for capital assets were used for the identification of embedded systems. In addition, and for other systems, walk-throughs (hands on surveys) were performed.
- The SCADA/EMS and financial control systems were classified as mission critical. The equipment with embedded chips were ranked as priority A, B and C with A being the highest criticality.
  - A - Direct impact on power system
  - B - Indirect impact with potential for generating a disturbance
  - C - No impact on power system.

*(Assessment strategy/testing- relied on vendor information, sample testing, simple testing – reduced data set etc.)*

- Vendor information was used if the vendor indicated that the equipment was not Y2k ready.
- Vendor statement was not accepted for mission-critical systems. These were tested by the utility itself although in some instances the test plan was not put into written form and the test results not kept on file. In no instance was a non-Y2k ready, mission-critical piece of equipment, identified in the Y2k inventory (Y2k database).

*(Critical supplier approach - Method used to identify critical suppliers; e.g. purchase records etc. (power suppliers, fuel suppliers, water suppliers, phone service, and other vendor strategy)*

- The power supplier and phone service providers had been contacted but no formal process has been established for identification of other key suppliers.

### 3.3 Test strategy and procedures for EMS/SCADA/Real-time

*(Risk based priority test strategy - highest business impact tests first and more comprehensive tests applied. Lower impact not tested at all or at a less detailed level or other strategies)*

- Testing of the SCADA/EMS system was performed on an ad hoc basis during factory acceptance tests. These tests were not documented.
- Testing of the SCADA/EMS system has been performed on a stand-alone (backup server) in 1998 and some tests repeated in 1999. However, AGC function could not be retested because no power plant simulation was feasible and live testing with the power plants was deemed to be undesirable.
- Testing of the sequence-of-events function from one new SOE ready RTU was performed in 1997. This test was not re-run in later tests.
- Communication systems and RTUs were tested but not to determine if the system was Y2k ready. For this, vendor information was relied upon to be more complete and accurate than internal tests.

*(Testing procedures - Compliance assessment testing: test date and date transitions testing; Application tests; validation tests (of remediation work); Differentiation between large and complex systems and small, stand-alone systems with embedded chips; Integrated tests or unit tests; Test audits)*

- Detailed test procedures were not developed. List of dates to be tested was prepared for SCADA/EMS and IT systems.
- No power-off testing has been performed by the utility for systems with embedded chips.

### 3.4 Remediation strategy for EMS/SCADA/Real-time

*(Fix or replace; in-house versus outsourcing; live with the problem and adjust settings manually; differentiation between large and complex systems and small stand-alone units)*

- UNIX operating system was upgraded with Y2k patches. These upgrades did not affect functions used in the SCADA/EMS system. It includes the UNIX mail and Chron. functions.
- Non-Y2k ready workstations are to be replaced in late 1999 with Y2k ready computers. These are not mission-critical devices.

### 3.5 Customer information and survey responses [Omitted for Phase II]

*(Active customer contacts to avoid irrational behavior of customers at the transition from year 1999 to 2000; response to requests for information on Y2k readiness from others such as local phone company, hospitals etc.)*

### 3.6 Quality control to ensure that Y2k readiness is achieved and maintained

*(Role of inside auditors; outside auditors, NERC test participation, procedures in place to ensure that readiness state is not lost as a result of warranty changes, upgrades etc.)*

- An independent verification and validation (IV&V) study was completed in May 1999.
- The utility participated in both the 4/9/99 and 9/9/99 drills. In addition, it has held seminars for its major customers to review Y2k readiness and to ensure that the customers will be Y2k ready too.
- Formal clean management procedures (configuration management process) were put in

place for SCADA/EMS system as of 9/30/99. Informal change control for other areas.

### 3.7 Contingency plans for EMS/SCADA/Real-time

*(Horizon for plan, trial of plan procedures, special staffing and manual controls at the transition, self-generation and special provisions to deal with large load swings, dependency on public communication systems and preparedness for phone system – including cellular system –overloads etc.)*

The plan includes manual staffing of key substations and the utility's private microwave communication system that is used to communicate with plant as well as key customers. There will also be a backup PC based unit receiving analog data via analog communication channels to provide information to the operators for the generation dispatch functions.

## 4. Position of the Utility at Time of Assessment

### 4.1 General position on EMS/SCADA/Real-time

*(Progress on schedule towards Y2k readiness; budget spent versus projected, remaining work; criticality of this work; participation in April 9 NERC Exercise; opinions of auditors – if any etc.)*

- Utility's contingency plan needs to be completed with staffing plans for New Year's Eve and beyond timeframes.
- Non-Y2k ready terminals for non-critical workstations will be upgraded before year's end.
- New digital microwave system will not be taken into service before year 2000.

### 4.2 Review of plans and relevant documentation

*(Existence of documents; errors and omissions in documents; vendor/supplier readiness information etc.)*

- There is only limited documentation available covering Y2k related test procedures and test results.
- Vendor information available for key mission-critical components. These documents show that the communication systems and SCADA-RTUs are Y2k ready.

### 4.3 Review of test records

*(Existence of test procedures; test result documentation; completeness on testing to known problem dates, test procedures likely to catch the known problems; reliance on vendor information or actual testing of mission-critical systems, use of test data from sources such as EPRI, other utilities or other organizations with relevant data etc.)*

- There are only summary documents available from the most recent SCADA/EMS system tests. However, retest of key hardware and software modules demonstrated that the correct time is displayed and correctly used by the SCADA functions. Power schedules into year-2000 were displayed on the primary SCADA/EMS system server.
- In addition to vendor provided information, the utility has relied on information from other sources such as EPRI and government utility organizations.

## 4.4 Retest of selected equipment/systems

*(Selection process – assessors allowed to select or utility selection, repeat of test generated, same results as when utility (or tester) did the test last time etc.)*

- At this audit, a retest of a backup server and an operator interface controller was performed. No remote was connected to the system so no data was updated.
- Alarms were generated during the tests by manually entering data above or below limits.
- 1. System re-initialized and system clock was set to 10 minutes before midnight 12/31/99. SCADA system restarted and displayed correct time. Alarms were generated.
- 2. Rollover of time into 1/1/00 and alarms generated. System time correctly displayed and system continued to function as before the rollover. Alarms were generated and alarm log displayed alarms in the correct time sequence.
- No other functions were testable on the system.
- Interchange schedule information was tested on the on-line system by selecting a future date in 2000. The DST to standard time schedules were reviewed and these displayed correct hourly data with 23 and 25 hours as appropriate. It was noted that year entry field did not accept 2000 but did accept 00 and interpreted this as year 2000. However, year 1999 could be entered as a four-digit date. This exception condition is non-critical and will be changed later.

## 5. Interviews

### 5.1 Interview #1 – *name and title of person interviewed*

*(Impressions from interview; concerns and or convictions and reasons for these)*

Title: Customer Service

- No concerns for the Y2k transition except maybe protection of system from vandalism.
- 9/9/99 drill involved a number of wholesale customers.
- Utility has means of reaching its customers in case of disturbances but customers' ability to reach utility may be more uncertain. This will be looked into further.

### 5.2 Interview #2 –

Title: Senior Computer Specialist

- Relied primarily on Y2k readiness testing by vendors because vendors could do a much more comprehensive test than utility could do itself. However testing was done by the utility on a sample basis.
- Training has been conducted of various contingency scenarios beginning in March of 1999. Tabletop exercises were held in June 1999.
- No special budget was allocated for Y2k activities so the effort had to be funded with the regular maintenance budget.
- There was some concern about security of systems in conjunction with New Year's Eve celebrations. Discussed defense of system protection systems against intrusions by hackers.



## 5.3 Key Concerns of Utility Managers

*(Include anything that may be helpful in understanding the reasons for the concern)*

- None in regards to operation of the power system but some concern about vandalism and other similar phenomena.

## 6. Key People Participating in the Assessment

### 6.1 Utility people (Titles only)

CEO

Y2k coordinator

Manager of operations

Manager of maintenance

Legal Council

Software and hardware engineers

## 7. EMS/SCADA/Real-time Comments

### 7.1 Preparations

- System was informally tested prior to delivery from factory in 1995 and was found Y2k ready at that time. However, test procedures and results were not documented at that time.

### 7.2 Vendor Responses

Operating system upgrades have been prepared by hardware vendor and installed in the SCADA/EMS system.

### 7.3 Testing

System has been retested by utility in 1998 with some additional tests performed in the spring of 1999. Test results not saved for most of the tests but pass/fail determination made at the time of the test and this test summary is on file.

Retest of main SCADA/EMS system server performed during the Y2k review. See item #4 above.

### 7.4 Sign-off/Certification

AGC function not possible to test at without impacting the generating plants. The function was tested in 1995 for Y2k readiness and the person doing this test at that time will prepare a memo to that effect in the Y2k file.

# Profile of Organization Visited      Site Number 2

## 1. Year 2000 Readiness

*Select Level 1, 2 or 3 from below (delete those that do not apply)*

Based on the information gathered from the on-site review, the assessor is to make an evaluation of the organization's EMS/SCADA/Real-time systems ability to meet readiness dates for all mission-critical functions. The assessor will assign an overall level of risk based on the following:

- ☒ Level 3:      Organization should meet a readiness date of 10/31/99 for EMS/SCADA/Real-time systems and will be Y2k ready by 12/31/99.

The assessors reached this conclusion based on the following insights:

- Well organized and thorough inventory of equipment and related documentation
- Early identification of system(s) designation of business versus mission critical
- Correctly reported Year 2000 readiness prior to NERC date of 6/30/1999
- Excellent documentation of Year 2000 related planning procedures and guidelines
- Participation and planning with the state emergency management agency
- Demonstration of system load management system operability before during and after the transition date
- Excellent allocation of internal and external resources in preparation for the transition

## 2. Profile of Utility

### 2.1 General statistical information

Utility Type:	Generation and Transmission Cooperative
Annual Gross Revenue (Year):	715 million
Control Area	Yes (limited)
System peak Demand:	359 MW (Summer) 431 MW (Winter)
Demand Characteristics:	
Number of Customers	208 k
Number of Residential Customers	162.4 k
Number of Commercial Customers	~ 11 k
Number of Industrial Customers	
Number of Other Customers	~1.8 k
Number of Substations:	200

### 2.2 Local Y2k environment

*(Include relevant information about the utility such as what fuel base is used for generation, black start capability, types of loads served by the utility, critical loads, dependence on power from others, degree of integration with other utilities etc.)*

- Utility serves a customer base that is more than 80% residential with of average usage per customer of 750 kWh per month.
- Utility operates its non-nuclear generation and a load management system (LMS) that has the capability of reducing the peak by about 45 MW. This load management system is used for reducing the peak demand billing from supplemental power suppliers. The LMS system

is also used to avoid distribution overloads by reducing demand in strategic locations and voluntarily used to help reduce system demand under critical transmission conditions. The system is highly integrated with other utilities, and these integrated utilities perform many of the control and metering functions.

### 3. Year 2000 Readiness History

#### 3.1 Start of Y2k preparation

*(When did the preparation begin and at whose initiative. What was the budget and personnel allocated to achieve Y2k readiness, key people in Y2k project with reporting – organization chart if available to be attached)*

- The Y2k preparation began in July 1998 and the utility has spent about \$300,000 on the effort.
- The manager of information technology was responsible for directing the Y2k team and the senior management support was from the vice-president of corporate services. There was key staff allocated from each division.
- The load management system was considered the most mission critical.

*(Role of outside consultants and auditors)*

- A consultant was utilized to assist the utility in the inventory process and to review the transmission facilities and the non-nuclear generation facility. The consultant also assisted in reviewing the readiness statements and the utility's progress in completing the readiness process.
- The assessment of company assets was performed on an integrated inventory of microprocessor-based equipment enlisted in business and mission-critical systems.

#### 3.2 Assessment strategy for EMS/SCADA/Real-time

*(Inventory process or the method used to identify inventory – walk through, BOM combinations etc. Identification of all possible components, all digital or only the critical digital systems. Definition of critical (i.e., business critical or mission critical - keep the lights on)*

- The inventory of the all the microprocessor-based systems was put together with the assistance of the consultant and the divisions within the utility.
- Critical systems were defined as those integrated with the load management system (LMS).

*(Assessment strategy/testing- relied on vendor information, sample testing, simple testing – reduced data set etc.)*

- The utility has relied on vendor information and had more confidence with statements from larger suppliers.
- The utility has performed its own testing on the load management system, communication systems and other related equipment.

*(Critical supplier approach - Method used to identify critical suppliers; e.g. purchase records etc. (power suppliers, fuel suppliers, water suppliers, phone service, and other vendor strategy)*

- Critical suppliers were identified as those by their relationship to the LMS:
  - LMS computer system
  - Communication to the substations

- Receivers
- Substation control units.

### 3.3 Test strategy and procedures for EMS/SCADA/Real-time

*(Risk based priority test strategy - highest business impact tests first and more comprehensive tests applied. Lower impact not tested at all or at a less detailed level or other strategies)*

- Testing for Y2k readiness focused on the load management and client systems.
- The test client system is located at the utility control center for testing and programming purposes. The client system can also initiate demand control commands. Communication contingency plan is to initiate load management commands from the client system.

*(Testing procedures - Compliance assessment testing: test date and date transitions testing; Application tests; validation tests (of remediation work); Differentiation between large and complex systems and small, stand-alone systems with embedded chips; Integrated tests or unit tests; Test audits)*

- The system date of the LMS master was “rolled” to 12/29/1999 on Friday October 8, 1999, for this test. This rollover date was selected to allow the historic database to be populated before the system rolled over to 1/1/2000. The system was monitored for any system alarms, historic data was retrieved from the database, and a load management test signal was sent to a test receiver in the control room.
- The operation of the client station was verified before and after the rollover date. This test involved retrieving historic data and monitoring the system for any alarms.

### 3.4 Remediation strategy for EMS/SCADA/Real-time

*(Fix or replace; in-house versus outsourcing; live with the problem and adjust settings manually; differentiation between large and complex systems and small stand-alone units)*

- The LMS server computer software was updated to be Y2k Ready. The update was coordinated with the system vendor and the utility programming staff.

### 3.5 Customer information and survey responses [Omitted for Phase II]

*(Active customer contacts to avoid irrational behavior of customers at the transition from year 1999 to 2000; response to requests for information on Y2k readiness from others such as local phone company, hospitals etc.)*

### 3.6 Quality control to ensure that Y2k readiness is achieved and maintained

*(Role of inside auditors; outside auditors, NERC test participation, procedures in place to ensure that readiness state is not lost as a result of warranty changes, upgrades etc.)*

- Regulated utilities within the state were required to be Y2k Ready by 3/31/1999, and although the organization was not required to follow this, it voluntarily complied with this deadline.
- Also participated in the April and September NERC drill dates. Auditors were not used for quality control or validation of the tests.

### 3.8 Contingency plans for EMS/SCADA/Real-time

*(Horizon for plan, trial of plan procedures, special staffing and manual controls at the transition, self-generation and special provisions to deal with large load swings, dependency on public communication systems and preparedness for phone system – including cellular system –overloads etc.)*

- The main contingency plan for the system is to use the client systems for sending out load management controls.
- Cellular telephones, satellite-based telephones, or the statewide emergency communication agency will guarantee communication with the client systems.

## 4. Position of the Utility at Time of Assessment

### 4.1 General position on EMS/SCADA/Real-time

*(Progress on schedule towards Y2k readiness; budget spent versus projected, remaining work; criticality of this work; participation in April 9 NERC Exercise; opinions of auditors – if any etc.)*

- The system has been tested and considered Y2k Ready since 3/31/1999.
- Some remaining work in obtaining readiness statements with integrated utilities, but all systems within the organization's control are ready.

### 4.1 Review of plans and relevant documentation

*(Existence of documents; errors and omissions in documents; vendor/supplier readiness information etc.)*

- Significant effort has been made to document the Y2k readiness effort including documenting vendor/supplier readiness information, test procedures, contingency plans, and inventory lists. This information was organized in a manner that made the information easily accessible.

### 4.2 Review of test records

*(Existence of test procedures; test result documentation; completeness on testing to known problem dates, test procedures likely to catch the known problems; reliance on vendor information or actual testing of mission-critical systems, use of test data from sources such as EPRI, other utilities or other organizations with relevant data etc.)*

- The test procedure attached to this report for the LMS was reviewed and is considered to be adequate.
- The system had been tested six times before the retest during this audit.

### 4.3 Retest of selected equipment/systems

*(Selection process – assessors allowed to select or utility selection, repeat of test generated, same results as when utility (or tester) did the test last time etc.)*

- The re-test of the system verified that the system is Y2k Ready.
- The utility staff was very willing to allow the auditing team to suggest other tests to verify readiness and the system performed the tests as expected.

## 5. Interviews

### 5.1 Interview #1 – *name and title of person interviewed*

*(Impressions from interview; concerns and or convictions and reasons for these)*

Title(s): Vice President of Power Supply and Engineering

- This person is very comfortable with the Y2k readiness of the organization.
- The Vice President was not intimately involved with all the details of being ready, but was comfortable that the utility has taken every reasonable measure to ensure that it will be able to deliver electricity to its customers during the Y2k transition dates.

### 5.2 Interview #2 –

Title(s): Manager of Information Technologies and Administrative Services

- Readiness statements from larger vendors were considered more credible than smaller organizations. The effort made this person more aware of the need for verifiable information, rather than just receiving information at face value.

### 5.3 Key Concerns of Utility Managers

*(Include anything that may be helpful in understanding the reasons for the concern)*

- The main concerns of the organization's managers are whether the integrated utilities will have any Y2k problems.
- Verbal statements have been received, but they have been hesitant to provide written statements.

## 6. Key People Participating in the Assessment

### 6.1 Utility people (Titles only)

- Manager of Information Technology & Administrative Services
- Supervisor and System Manager, Load Management
- Manager of Information Technology and Administrative Services
- Vice President, Power Supply and Engineering

## 7. EMS/SCADA/Real-time Comments

### 7.1 Preparations

- The system was first found to be not Y2k Ready because of its platform. Given the system's "uniqueness", obtaining upgrades and vendor guidance was met with little (or no) resistance, and, in fact, was reportedly quite easy.

### 7.2 Vendor Responses

- The utility worked closely with the system vendor to ensure that the other operating system and EMS software were ready.
- The utility has contacted most, if not all, of its vendors that have influence in mission-critical activities. For the most part, the result of this contact has yielded vendor letters.

### **7.3 Testing**

- Testing has been performed on the system numerous times.
- Testing upgrades have also been performed at all remote components of the system.

### **7.4 Sign-off/Certification**

- The utility has reached a level of self-assurance and anticipates no disruptions.
- The utility has received the "normal" statements from communications providers.

# Profile of Organization Visited      Site Number 3

## 1. Year 2000 Readiness

*Select Level 1, 2 or 3 from below (delete those that do not apply)*

Based on the information gathered from the on-site review, the assessor is to make an evaluation of the organization's EMS/SCADA/Real-time systems ability to meet readiness dates for all mission-critical functions. The assessor will assign an overall level of risk based on the following:

- ☒ Level 3:      Organization should meet a readiness date of 10/31/99 for EMS/SCADA/Real-time systems and will be Y2k ready by 12/31/99.

The assessors reached this conclusion based on the following insights:

- SCADA system is Y2k ready; remediation completed by vendor and passed tests
- Company owns extensive communication system for use with distributors, generators, power pool etc.; would facilitate response to any credible Y2k incident
- Adequate documentation of Y2k but utility lacks documentation linking physical inventory and Y2k sensitive equipment
- Solid high-level management support for Y2k project

## 2. Profile of Utility

### 2.1 General statistical information

Utility Type:	Generation & Transmission Cooperative
Annual Gross Revenue (Year):	
Control Area	No
System peak Demand:	about 600 MW
Demand Characteristics:	
Number of Customers	8 Distribution Coops
Number of Residential Customers	
Number of Commercial Customers	
Number of Industrial Customers	
Number of Other Customers	
Number of Substations:	about 90

### 2.2 Local Y2k environment

*(Include relevant information about the utility such as what fuel base is used for generation, black start capability, types of loads served by the utility, critical loads, dependence on power from others, degree of integration with other utilities etc.)*

- Utility owns two small coal-fired power plants. No black start capability is available.
- Utility serves a number of distribution cooperatives but has no demand of its own.
- The utility wheels power from the generating utility to the distribution co-ops. This is the role of a T-company.
- Utility owns an extensive communication (microwave) system connecting all of its facilities as well as providing communication links to distributors and generators.

## 3. Year 2000 Readiness History



### 3.1 Start of Y2k preparation

*(When did the preparation begin and at whose initiative. What was the budget and personnel allocated to achieve Y2k readiness, key people in Y2k project with reporting – organization chart if available to be attached)*

- The utility's Y2k efforts began in 1998, within the business support systems. In June 1998, the utility began to focus on the T&D operating support systems. Prior to that time, the departments had a preliminary review of the computerized and solid-state devices used in their department. Following the initial determination of Y2k readiness, letters of Y2k readiness were obtained from suppliers and manufacturers for equipment as appropriate. Actual Y2k rollover testing was completed on many systems.
- Any equipment identified as not Y2k Ready or unable to be made ready, was included in the 1999 budget for replacement.
- The mission-critical systems were Y2k Ready in Mid-May 1999.
- The Y2k team leader reports to the CEO and General Manager of the Utility.

*(Role of outside consultants and auditors)*

- None have been used.

### 3.2 Assessment strategy for EMS/SCADA/Real-time

*(Inventory process or the method used to identify inventory – walk through, BOM combinations etc. Identification of all possible components, all digital or only the critical digital systems. Definition of critical (i.e., business critical or mission critical - keep the lights on)*

- The utility used an inventory database to identify the equipment that might be sensitive to Y2k.
- The SCADA system is small and it is, therefore, easy to count all pieces of equipment.
- The utility uses an extensive communication system (microwave, radio, fiber optics) that supports SCADA system. Inventoried based on existing database.
- All equipment in the substations was already accounted for in the equipment maintenance database.
- No prioritization of inventory for assessment purposes – all equipment was checked for Y2k readiness.

*(Assessment strategy/testing- relied on vendor information, sample testing, simple testing – reduced data set etc.)*

- Vendor information used for Y2k assessment.

*(Critical supplier approach - Method used to identify critical suppliers; e.g. purchase records etc. (power suppliers, fuel suppliers, water suppliers, phone service, and other vendor strategy)*

- Vendors that had supplied equipment were surveyed.
- Phone system was determined to be not critical for the utility's operations.
- No special precautions were taken to increase spare parts supplies etc. because inventories are considered sufficient for the Y2k transition.

### 3.3 Test strategy and procedures for EMS/SCADA/Real-time

*(Risk based priority test strategy - highest business impact tests first and more comprehensive tests applied. Lower impact not tested at all or at a less detailed level or other strategies)*

- Only the SCADA system was given extensive tests.

*(Testing procedures - Compliance assessment testing: test date and date transitions testing; Application tests; validation tests (of remediation work); Differentiation between large and complex systems and small, stand-alone systems with embedded chips; Integrated tests or unit tests; Test audits)*

- Testing included one digital relay with a simple date transition test, but did not include tests with a loss of auxiliary power.
- The vendor website provided information regarding Y2k readiness.

### 3.4 Remediation strategy for EMS/SCADA/Real-time

*(Fix or replace; in-house versus outsourcing; live with the problem and adjust settings manually; differentiation between large and complex systems and small stand-alone units)*

- Original supplier was still under a contract and completed the upgrades.
- Vendor and utility completed testing jointly in mid-May, 1999.

### 3.5 Customer information and survey responses [Omitted for Phase II]

*(Active customer contacts to avoid irrational behavior of customers at the transition from year 1999 to 2000; response to requests for information on Y2k readiness from others such as local phone company, hospitals etc.)*

### 3.6 Quality control to ensure that Y2k readiness is achieved and maintained

*(Role of inside auditors; outside auditors, NERC test participation, procedures in place to ensure that readiness state is not lost as a result of warranty changes, upgrades etc.)*

- No auditing or consulting support was requested. None required by anyone.
- The boilers used for both units of utility owned generating plant are currently in the process of being modified to burn low sulfur western coal. All new controls associated with the boiler conversion will be Y2k Ready.

### 3.7 Contingency plans for EMS/SCADA/Real-time

*(Horizon for plan, trial of plan procedures, special staffing and manual controls at the transition, self-generation and special provisions to deal with large load swings, dependency on public communication systems and preparedness for phone system – including cellular system –overloads etc.)*

- The utility will not rely on public phone systems for operation of the power system or for communication with the utility crews.
- System is supported by an extensive communication system with alternative communication paths available for many of the key substations. This reduces the probability for a complete loss of communication between the SCADA master and the remote units.
- System can be operated in manual if needed.

## 4. Position of the Utility at Time of Assessment

### 4.1 General position on EMS/SCADA/Real-time

*(Progress on schedule towards Y2k readiness; budget spent versus projected, remaining work; criticality of this work; participation in April 9 NERC Exercise; opinions of auditors – if any etc.)*

- The utility has not tracked budget expenditures associated with the Y2k conversion except for capital equipment additions and external purchase orders.
- Utility has not participated in any of the NERC sponsored drills.
- Utility's mission-critical systems were ready in May 1999. Minor Y2k related work on non-mission-critical systems continued after mid-1999.
- Digital relays connected to utility office via secure, non-public communication lines/links.

### 4.2 Review of plans and relevant documentation

*(Existence of documents; errors and omissions in documents; vendor/supplier readiness information etc.)*

- Documentation lacked details of inventory and test procedures, however, the list of equipment appeared complete for the type and size of the utility.
- Test procedures for systems with embedded chips were sparse. However, none of the equipment listed by the utility was of a type with known serious Y2k related defects.
- Vendor information was available to support the conclusion that the equipment is Y2k Ready. Although utility was lacking in documentation, no major hole in the readiness status of the equipment was identified.

### 4.3 Review of test records

*(Existence of test procedures; test result documentation; completeness on testing to known problem dates, test procedures likely to catch the known problems; reliance on vendor information or actual testing of mission-critical systems, use of test data from sources such as EPRI, other utilities or other organizations with relevant data etc.)*

See above.

### 4.4 Retest of selected equipment/systems

*(Selection process – assessors allowed to select or utility selection, repeat of test generated, same results as when utility (or tester) did the test last time etc.)*

- No equipment was available for retest. It would have required taking the SCADA system out of service with risk of causing accidental tripping of equipment.
- Review was limited to test data records and vendor assertions.

## 5. Interviews

### 5.1 Interview #1 – *name and title of person interviewed*

*(Impressions from interview; concerns and or convictions and reasons for these)*

Title: General Manager & CEO

## 5.2 Interview #2 –

Title: IT Engineer

## 5.3 Key Concerns of Utility Managers

*(Include anything that may be helpful in understanding the reasons for the concern)*

- Risk of vandalism or intentional damage to substation equipment and other facilities.
- Public panic causing problems that would not otherwise occur.

## 6. Key People Participating in the Assessment

### 6.1 Utility people (Titles only)

- CEO/General Manager
- Manager of Engineering and Operations
- SCADA Engineer
- IT System Software Engineer

## 7. EMS/SCADA/Real-time Comments

### 7.1 Preparations

The following hardware and/or software was installed and Y2k tested by Vendor A and utility personnel during the month of May 1999:

1) "A" & "B" servers

- The Y2k fix patch was applied to the Vendor B operating system
- The latest version (6.4) of the C-3 Vendor A SCADA software was installed
- The latest version (6.17) of the C-3 Vendor A Database software was installed
- All known operating system and SCADA problems with the year 2000 rollover were corrected with these upgrades.
- The existing database and custom displays were converted to the new system formats

2) Four Local Operator WorkStations

- Y2k fix patch applied to Vendor B operating system
- Latest version (6.4) of the C-3 Vendor A SCADA software was installed

4) Millennium ISA BIOS boards were installed in each operator workstation

3) Eleven Remote WorkStations

- 11 new PCs were purchased as replacements for all existing remote workstations.
- The latest version of the Vendor B operating system (version 4) was installed
- Latest version (6.4) of the C-3 Vendor A SCADA software was installed
- Latest version of the Vendor A Remote Communication software was installed

### 7.2 Vendor Responses

- The vendor responded in a timely fashion so that the utility could identify known problems with the SCADA system and apply the upgrades and fixes before June 30

### 7.3 Testing

The utility requested testing guidelines and a list of potential problems that might occur by changing the system date to 12/31/99 and allowing the system to rollover into the year 2000. There was potential to lose historic data, current event logs and data log files. These issues were addressed in a document requested from the vendor.

After careful review and discussion of the items outlined in the document, the testing proceeded as follows:

- The "A" server was backed up to a tape backup device to preserve the current state of the SCADA before testing.
- Critical history data, database files, picture files, and current event and data log files were replicated in different location on the "A" server
- The SCADA network and all PCs were shut down. All PC system clocks were synchronized and the date advanced to 12/31/99. The system was restarted with the "B" server as the active server and the system rolled over to 1/1/00 with no apparent difficulties.
- The system was stopped and restarted on server "B" with no apparent difficulties
- The PCs were powered off and powered back on. This test was performed to insure that the date and time had been properly retained through a power off/on cycle. Date and times were verified on the PCs and servers.
- The system was forced to fail over to the "A" server with no difficulties noted
- The system was forced to fail back over to the "B" server with no difficulties noted
- All remote work stations continued to operate normally during the system clock test
- The RTUs continued to communicate normally during test

The following functions were specifically checked during the test

- Historical Logs
- Pulse Accumulator values
- Power Factor Monitoring
- Demand Control
- Load Management Database

### 7.4 Sign-off/Certification

- The vendor has worked with the utility in upgrades/fixes and testing procedures. The vendor has stated that the SCADA software the utility is now using is Y2k Ready.

# Profile of Organization Visited      Site Number 4

## 1. Year 2000 Readiness

*Select Level 1, 2 or 3 from below (delete those that do not apply)*

**Based on the information gathered from the on-site review, the assessor is to make an evaluation of the organization's EMS/SCADA/Real-time systems ability to meet readiness dates for all mission-critical functions. The assessor will assign an overall level of risk based on the following:**

- ☒ Level 3:      Organization should meet a readiness date of 10/31/99 for EMS/SCADA/Real-time systems and will be Y2k ready by 12/31/99.

The assessors reached this conclusion based on the following insights:

- Performed overall testing of EMS/SCADA control center system
- Worked with vendor to have sub-systems and source code of EMS/SCADA software tested and reviewed
- Performed device level and integrated testing
- Early understanding and acceptance of Y2k issues
- Good overall project documentation
- Participation in industry drills (4/9/99 and 9/9/99)
- Communication systems: Non-EMS/SCADA – Excellent first, second, third, and fourth order communication tested, implemented, etc.
- Communications systems: EMS/SCADA related – communication systems have been well inventoried and tested; little or no risk of EMS/SCADA communication problems

## 2. Profile of Utility

### 2.1 General statistical information

Utility Type:	Generation & Transmission Cooperative
Annual Gross Revenue (Year):	313M (1998)
Control Area	No
System peak Demand:	1098 MW
Demand Characteristics:	
Number of Customers	11
Number of Residential Customers	
Number of Commercial Customers	
Number of Industrial Customers	
Number of Other Customers	
Number of Substations:	185

## 2.2 Local Y2k environment

*(Include relevant information about the utility such as what fuel base is used for generation, black start capability, types of loads served by the utility, critical loads, dependence on power from others, degree of integration with other utilities etc.)*

- The utility has a total of four tie-points with three neighboring utility systems.
- The utility has one coal generating plant and one natural gas/fuel oil (dual fuel) generating plant that has black-start capability.

## 3. Year 2000 Readiness History

### 3.1 Start of Y2k preparation

*(When did the preparation begin and at whose initiative. What was the budget and personnel allocated to achieve Y2k readiness, key people in Y2k project with reporting – organization chart if available to be attached)*

- The utility began its Y2k preparations near the end of 1996, for CIS in-house software applications, PC hardware, and LAN hardware.
- At July of 1998, the Y2k program expanded to all of the utility's systems (with embedded chips).
- The director of Information Systems was appointed the Y2k Project Coordinator for the entire utility.

*(Role of outside consultants and auditors)*

- The utility's auditing firm made general inquiries about Y2k during its regular annual audit in November 1997.
- In the 1998 audit, the auditing firm conducted phone interviews to assess the progress of the utility's Y2k project. These phone interviews satisfied the auditing firm that the utility was on the right track and it deemed that no on-site interviews were warranted.

### 3.2 Assessment strategy for EMS/SCADA/Real-time

*(Inventory process or the method used to identify inventory – walk through, BOM combinations etc. Identification of all possible components, all digital or only the critical digital systems. Definition of critical (i.e., business critical or mission critical - keep the lights on)*

- Department managers were responsible for performing the inventory of their own respective areas.
- Property records were used extensively to gather the inventory information.
- The utility's Y2k project manager was responsible for contacting vendors for Y2k readiness information for the equipment in their department's inventory (included readiness, test information, upgrades, etc.).

*(Assessment strategy/testing- relied on vendor information, sample testing, simple testing – reduced data set etc.)*

- The utility ran the entire EMS system through the "New Century Transition Test" as a means of assessment. They also contracted the vendor to test each sub-system of the EMS.
- The utility used both vendor information and sample testing for the assessment of the RTUs.

*(Critical supplier approach - Method used to identify critical suppliers; e.g. purchase records etc. (power suppliers, fuel suppliers, water suppliers, phone service, and other vendor strategy)*

- It did not identify its critical suppliers.

### **3.3 Test strategy and procedures for EMS/SCADA/Real-time**

*(Risk based priority test strategy - highest business impact tests first and more comprehensive tests applied. Lower impact not tested at all or at a less detailed level or other strategies)*

- Risk-based priority test strategy was used.

*(Testing procedures - Compliance assessment testing: test date and date transitions testing; Application tests; validation tests (of remediation work); Differentiation between large and complex systems and small, stand-alone systems with embedded chips; Integrated tests or unit tests; Test audits)*

- Testing was used in assessment and to validate remediation work.
- Test date and date transaction tests were performed.
- Integrated and device level testing was performed.

### **3.4 Remediation strategy for EMS/SCADA/Real-time**

*(Fix or replace; in-house versus outsourcing; live with the problem and adjust settings manually; differentiation between large and complex systems and small stand-alone units)*

- The utility used a “replace and upgrade” remediation strategy. The vendor performed the fix and the utility performed remediation to achieve readiness.
- No workarounds were used.

### **3.5 Customer information and survey responses [Omitted for Phase II]**

*(Active customer contacts to avoid irrational behavior of customers at the transition from year 1999 to 2000; response to requests for information on Y2k readiness from others such as local phone company, hospitals etc.)*

### **3.6 Quality control to ensure that Y2k readiness is achieved and maintained**

*(Role of inside auditors; outside auditors, NERC test participation, procedures in place to ensure that readiness state is not lost as a result of warranty changes, upgrades etc.)*

- Microprocessor-based purchases are routed through Y2k coordinator's office for approval. A recent Turbine control system purchase for one of the generating plants was specified to be Y2k Ready.



### 3.7 Contingency plans for EMS/SCADA/Real-time

*(Horizon for plan, trial of plan procedures, special staffing and manual controls at the transition, self-generation and special provisions to deal with large load swings, dependency on public communication systems and preparedness for phone system – including cellular system –overloads etc.)*

- People will be stationed near all circuit breakers on New Year's Eve and radio/cell phone communication will be used to maintain contact with the control center.
- Employees practiced the Contingency Plan during the September 9<sup>th</sup> drill.
- Fifteen minutes are scheduled to manually update EMS/SCADA metering.

## 4. Position of the Utility at Time of Assessment

### 4.1 General position on EMS/SCADA/Real-time

*(Progress on schedule towards Y2k readiness; budget spent versus projected, remaining work; criticality of this work; participation in April 9 NERC Exercise; opinions of auditors – if any etc.)*

- Utility is well prepared for Y2k. It appears that the system will have no problems in the Y2k.
  - Achieved readiness by its target date of June 1999.
  - Participated in NERC drills.
  - The utility re-ran an integrated test of the EMS system as part of this audit

### 4.2 Review of plans and relevant documentation

*(Existence of documents; errors and omissions in documents; vendor/supplier readiness information etc.)*

- Y2k Readiness Binder
- Y2k Contingency Plan
- NERC Drill Binder

### 4.3 Review of test records

*(Existence of test procedures; test result documentation; completeness on testing to known problem dates, test procedures likely to catch the known problems; reliance on vendor information or actual testing of mission-critical systems, use of test data from sources such as EPRI, other utilities or other organizations with relevant data etc.)*

- Utility relied on vendor statements and websites for Y2k information.
- Vendor of DCS system at generating plant performed testing.
- System testing included an in-house component and integrated testing with an array of dates for EMS and RTUs.
- Power on/power off rollover methodology used.

### 4.4 Retest of selected equipment/systems

*(Selection process – assessors allowed to select or utility selection, repeat of test generated, same results as when utility (or tester) did the test last time etc.)*

#### Test #1 – SCADA/EMS and RTUs

This test was performed at the utility's main building in the maintenance room.

The test set-up:

- A PC with the maintenance software was connected to the RTU to input the date/time and perform commands on it.
  - A laptop was connected to the RTU to act as a control center simulator.
- 1) 12/31/99 – 1/1/00 rollover test
    - The RTU clock was allowed to rollover.
    - Performed a trip command (RTU relay opened).
    - Integrated the RTU with the laptop (recorded the trip).
  - 2) 2/28/00 – 2/29/00 rollover test
    - The RTU clock was allowed to rollover.
    - Performed a trip command (RTU relay opened).
    - Integrated the RTU with the laptop (recorded the trip).

**Test #2** – EMS control system test on the Program Development System

Test set-up:

- The historical database was backed-up.
  - The system clock was set to 12/31/99 23:50:00.
- 1) The system clock rolled over to 1/1/00.
    - An RTU door switch was opened, in the field, to test alarming.
    - Acknowledged the alarm.
    - Performed a command (opened a transmission switch).
    - Field verification of switch opening.
    - Checked the historical database for proper recording and ordering (time stamp).
    - All tests showed the system operating correctly.

## 5. Interviews

### 5.1 Interview #1 – *name and title of person interviewed*

*(Impressions from interview; concerns and or convictions and reasons for these)*

Title (s): Planning and Metering Engineer, Electronics Technician

- They found no problems and thought that Y2k would be a non-event. Both engineers questioned whether utilities and businesses would experience any actual problems associated with Y2k.
- The utility coordinated with neighboring utilities during the Sept. 9 drill.

### 5.2 Interview #2 –

Title(s): Director of Engineering Systems

- EMS required few fixes (master station OS and EMS source code). They had no problem with the vendor in obtaining them.
- The utility has an ICCP link to its Security Coordinator. The ICCP provider (vendor) tested this connection for Y2k readiness. The EMS is connected to the corporate LAN by way of an Ethernet connection through a router. The router was tested for Y2k readiness during the EMS testing. They can contact neighboring utilities with hot line phones and a satellite phone, if necessary.

### 5.3 Key Concerns of Utility Managers

*(Include anything that may be helpful in understanding the reasons for the concern)*

- They paid one vendor a large sum of money for a remediation upgrade and they recently heard that the company fired their Y2k team.

## 6. Key People Participating in the Assessment

### 6.1 Utility people (Titles only)

Director of Computer Information Systems/Y2k Coordinator  
Planning and Metering Engineer  
Electronics Technician  
Director of Engineering Systems  
Director of Operations  
Computer Systems Technician  
Chief Dispatcher  
Manager of Engineering  
Manager of Production  
Manager of Corporate Affairs

## 7. EMS/SCADA/Real-time Comments

### 7.1 Preparations

- EMS system testing used as a means of assessment
- Contracted vendor for additional testing
- They found that the master station operating system had to be upgraded and the EMS source code required remediation.
- Worked with vendor to have upgrades by June 30, 1999.

### 7.2 Vendor Responses

- The vendor tested each sub-system of the EMS for Y2k readiness and provided the upgrades to the master station operating system and EMS source code in a timely fashion so the utility could meet the June 30 deadline.

### 7.3 Testing

- The utility staff checked the firmware numbers of the RTUs to ensure sample testing was valid.
- The vendor provided test procedures for RTU.

### 7.4 Sign-off/Certification

- The utility received a readiness statement from the EMS vendor.

# Profile of Organization Visited      Site Number 5

## 1. Year 2000 Readiness

*Select Level 1, 2 or 3 from below (delete those that do not apply)*

**Based on the information gathered from the on-site review, the assessor is to make an evaluation of the organization's EMS/SCADA/Real-time systems ability to meet readiness dates for all mission-critical functions. The assessor will assign an overall level of risk based on the following:**

- ☒ Level 3:      Organization should meet a readiness date of 10/31/99 for EMS/SCADA/Real-time systems and will be Y2k ready by 12/31/99.

The assessors reached this conclusion based on the following insights:

- The use of an Executive Steering Committee aids in keeping the Y2k project at a high level of awareness across the company business units
- Y2k Readiness credibility is high because every mission-critical device that could be tested was tested.
- Made use of internal audits.
- Good contingency planning for "keeping the lights on".
- Every device has a readiness review document with signoff at three levels.

## 2. Profile of Utility

### 2.1 General statistical information

Utility Type:	Investor Owned Utility
Annual Gross Revenue (Year):	\$2,900,000,000
Control Area	No
System peak Demand:	7473
Demand Characteristics:	
Number of Customers	1,600,000
Number of Residential Customers	
Number of Commercial Customers	
Number of Industrial Customers	
Number of Other Customers	
Number of Substations:	1000

### 2.2 Local Y2k environment

*(Include relevant information about the utility such as what fuel base is used for generation, black start capability, types of loads served by the utility, critical loads, dependence on power from others, degree of integration with other utilities etc.)*

- Company's primary fuel source for generation is coal, with about 10% of its capacity in nuclear. Not all of its units have black start capability because there are many sources of black start capacity and a well-defined core path to provide that capacity to all of its generator sites.
- The company serves only a few large industrial customers and most of its service area would be considered rural.
- The company has tight electrical ties to its immediate utility neighbor and is in a regional

power pool.

- The company has sufficient generation to not be dependant on others for capacity to meet its customer's needs.

### 3. Year 2000 Readiness History

#### 3.1 Start of Y2k preparation

*(When did the preparation begin and at whose initiative. What was the budget and personnel allocated to achieve Y2k readiness, key people in Y2k project with reporting – organization chart if available to be attached)*

- The Y2k program began in the fall of 1994. A Y2k Policy Committee of senior officers of the company has been in place since fall of 1997.
- The budget for the Y2k Program was about \$20,000,000 which was included in the five year corporate plan in 1995.
- The Y2k Program Office reports to a Y2k Executive Steering Committee of company officers.
- All departments coordinated their plans through the Y2k Program Office.
- Each organizational line of company Business (30) had an individual assigned as coordinator.
- In addition to biweekly meetings, a newsletter distributed by E-mail was disseminated weekly to keep all hands aware of progress.

*(Role of outside consultants and auditors)*

- An outside consultant was brought in to review the inventory list at the nuclear facility.
- In addition, the nuclear organization was a member of the USA Alliance.

#### 3.2 Assessment strategy for EMS/SCADA/Real-time

*(Inventory process or the method used to identify inventory – walk through, BOM combinations etc. Identification of all possible components, all digital or only the critical digital systems. Definition of critical (i.e., business critical or mission critical - keep the lights on)*

- All software and any element that performed a control function or displayed time were included on the inventory list.
- Any item on the inventory list identified as mission critical (keep the lights on) was assigned a priority 1 – must test if possible.

*(Assessment strategy/testing- relied on vendor information, sample testing, simple testing – reduced date set etc.)*

- In the case of unique priority 1 items, a full test was performed if possible.
- In the case of multiple instances of an inventory item, at least one such device was fully tested.
- Priority 1 items were accepted on the basis of vendor assurances only when it was not possible to test the item.

*(Critical supplier approach - Method used to identify critical suppliers; e.g. purchase records etc. (power suppliers, fuel suppliers, water suppliers, phone service, and other vendor strategy)*

- Purchase records, knowledge of suppliers.

### **3.3 Test strategy and procedures for EMS/SCADA/Real-time**

*(Risk based priority test strategy - highest business impact tests first and more comprehensive tests applied. Lower impact not tested at all or at a less detailed level or other strategies)*

- Test all aspects of the EMS software and operation and at least one of each RTU type. There are 10 RTU types.

*(Testing procedures - Compliance assessment testing: test date and date transitions testing; Application tests; validation tests (of remediation work); Differentiation between large and complex systems and small, stand-alone systems with embedded chips; Integrated tests or unit tests; Test audits)*

- All standard dates were tested on the EMS. The individual servers were tested for up to 100 Dates – 3 or 4 per year out through 2029.
- One of each type of RTU was tested thoroughly, but it was found that the date function was not used in the RTU function. While date was kept locally on the RTU and would rollover properly with power on, time stops updating on the RTU with power off – so a power off rollover never happens.

### **3.4 Remediation strategy for EMS/SCADA/Real-time**

*(Fix or replace; in-house versus outsourcing; live with the problem and adjust settings manually; differentiation between large and complex systems and small stand-alone units)*

- Only four very minor Y2k problems were found throughout the extensive Y2k testing of the EMS. Two of the four were fixed with in-house staff. A vendor was hired to fix the third. The fourth has no operational consequence and will not be fixed.

### **3.5 Customer information and survey responses [Omitted for Phase II]**

*(Active customer contacts to avoid irrational behavior of customers at the transition from year 1999 to 2000; response to requests for information on Y2k readiness from others such as local phone company, hospitals etc.)*

### **3.6 Quality control to ensure that Y2k readiness is achieved and maintained**

*(Role of inside auditors; outside auditors, NERC test participation, procedures in place to ensure that readiness state is not lost as a result of warranty changes, upgrades etc.)*

- Internal auditors were used to review the Y2k program periodically. In addition, the company's external corporate auditor reviewed the Y2k program for purposes of the annual report.
- The company participated in both NERC Y2k drills.
- A "clean management" program is in place and a change "lockdown" will be in effect from 11/22/99 to 1/15/00.

### 3.7 Contingency plans for EMS/SCADA/Real-time

*(Horizon for plan, trial of plan procedures, special staffing and manual controls at the transition, self-generation and special provisions to deal with large load swings, dependency on public communication systems and preparedness for phone system – including cellular system –overloads etc.)*

- A full complement of EMS/SCADA staff will be at their regular work locations for the rollover.
- All generation sites will be attended, and all steam units are expected to be on-line.
- Four levels of backup communications exist and have been tested during the NERC drills.
- A company representative with a company radio will be stationed at the State Police emergency center to provide rapid communications.
- All major interconnection substations as well as those substations needed for black start capability will have people stationed at them.
- The demand at the time of the rollover is expected to be less than 50% of the summer peak demand.

## 4. Position of the Utility at Time of Assessment

### 4.1 General position on EMS/SCADA/Real-time

*(Progress on schedule towards Y2k readiness; budget spent versus projected, remaining work; criticality of this work; participation in April 9 NERC Exercise; opinions of auditors – if any etc.)*

- The EMS/SCADA was 100% Y2k ready at the time of the assessment.

### 4.2 Review of plans and relevant documentation

*(Existence of documents; errors and omissions in documents; vendor/supplier readiness information etc.)*

- The Y2k plans and Contingency plans were complete. In addition, where mission-critical (Priority 1) facilities could not be tested a complete copy of correspondence with and a record of assurances from the provider were available and reviewed by the audit team.

### 4.3 Review of test records

*(Existence of test procedures; test result documentation; completeness on testing to known problem dates, test procedures likely to catch the known problems; reliance on vendor information or actual testing of mission-critical systems, use of test data from sources such as EPRI, other utilities or other organizations with relevant data etc.)*

- The documents provided comprehensive view of the inventory/assessment/testing-remediation activities. In addition, each device has a readiness review document associated with it which must be signed off at three levels (tester, owner, manager) before the device is recorded as Y2k ready.
- There are even records of tests of devices that may be installed after 1/1/2000

#### 4.4 Retest of selected equipment/systems

*(Selection process – assessors allowed to select or utility selection, repeat of test generated, same results as when utility (or tester) did the test last time etc.)*

- The assessors accepted the company suggested retesting of the EMS Network Application Software and one RTU as being meaningful tests to witness.

### 5. Interviews

#### 5.1 Interview #1 – *name and title of person interviewed*

*(Impressions from interview; concerns and or convictions and reasons for these)*

Title: General Technical Analyst

- This individual performed tests on components of the EMS/SCADA system including the RTUs.
- He is satisfied and convinced that all company facilities that he knows of or deals with are Y2k ready now.
- He is unwilling to accept vendor assurances of Y2k Readiness unless there is no way to test the device.

#### 5.2 Interview #2 –

Title: Principal Engineers

- These individuals are sure that the company is Y2k ready now.
- They were willing to accept vendor assurances on priority 2 or 3 items, but on priority 1 items (mission critical) only when it was not possible to test.
- They reported that the company had contacted 1,300 critical suppliers.
- The company is building up critical inventories to be ready for 12/31/99.

#### 5.3 Key Concerns of Utility Managers

*(Include anything that may be helpful in understanding the reasons for the concern)*

- Their concerns were external to the company. They are concerned about public reaction (panic) and media hype.
- Also mentioned was concern of vandalism and cyber threats associated with the Y2k rollover.

### 6. Key People Participating in the Assessment

#### 6.1 Utility people (Titles only)

Member Y2k Program Office

Member Y2k Program Office

Principal Engineer, project manager for electric Y2k (T&D)

Principal Engineer, project manager for contingency planning Elec. Ops.

Embedded test Team Leader, Senior Engineer, equipment performance test



Nuclear lead project manager  
General Technical Analyst

## **7. EMS/SCADA/Real-time Comments**

### **7.1 Preparations**

- The EMS/SCADA system has been thoroughly tested.
- The three meaningful software glitches found have been remediated and validated.
- A full complement of knowledgeable staff will be at their normal work locations at the time of the rollover.

### **7.2 Vendor Responses**

- Where vendor assurances were accepted on mission-critical devices or processes that could not be tested, they were convincing.

### **7.3 Testing**

- The test plans we examined and the retests we witnessed were thorough and well thought out.

### **7.4 Sign-off/Certification**

- The readiness review document review process with its three levels of sign-off is a good way to assure that key and knowledgeable individuals are convinced that each device has achieved Y2k Readiness.
- In addition, a quality assurance team reviewed the documentation of each embedded device.

# Profile of Organization Visited

Site Number 6

## 1. Year 2000 Readiness

*Select Level 1, 2 or 3 from below (delete those that do not apply)*

**Based on the information gathered from the on-site review, the assessor is to make an evaluation of the organization's EMS/SCADA/Real-time systems ability to meet readiness dates for all mission-critical functions. The assessor will assign an overall level of risk based on the following:**

- ☒ Level 3: Organization should meet a readiness date of 10/31/99 for EMS/SCADA/Real-time systems and will be Y2K ready by 12/31/99.

The assessors reached this conclusion based on the following insights:

- The EMS/SCADA system is Y2k ready at the time of this review.
- Excellent top management support of the Y2k program.
- Excellent Y2k contingency plans.
- A highly motivated and competent Y2k project team.
- The credibility of the Y2k Readiness is high since every mission-critical device that could be tested was tested.
- Excellent balance in coordinating centralized Y2k project team and the individual Business Units' project teams.

## 2. Profile of Utility

### 2.1 General statistical information

Utility Type:	Investor Owned Utility
Annual Gross Revenue (Year):	\$17.6 Billion
Control Area	Yes
System peak Demand:	19,652
Demand Characteristics:	
Number of Customers	2,000,000
Number of Residential Customers	
Number of Commercial Customers	
Number of Industrial Customers	
Number of Other Customers	
Number of Substations:	200

### 2.2 Local Y2K environment

*(Include relevant information about the utility such as what fuel base is used for generation, black start capability, types of loads served by the utility, critical loads, dependence on power from others, degree of integration with other utilities etc.)*

- This large utility has a large nuclear generation program that complements its primarily coal-fired fossil generation capacity. It has many black start units.
- It is heavily interconnected with other large electric operating entities in its region.
- It is a NERC Regional Security Coordinator.

### 3. Year 2000 Readiness History

#### 3.1 Start of Y2K preparation

*(When did the preparation begin and at whose initiative. What was the budget and personnel allocated to achieve Y2K readiness, key people in Y2K project with reporting – organization chart if available to be attached)*

- The Y2k program began late in 1996 primarily as an information technology issue. In early 1997, the embedded systems were recognized as a major issue, and the program was expanded corporate wide.
- The Y2k budget was estimated to be \$65 million, and it appears the final expenditure will come in at about \$60 million.

*(Role of outside consultants and auditors)*

- Both internal and external auditors have reviewed the Y2k program periodically. Most, if not all, of the recommendations coming from these reviews have been incorporated into the Y2k program.

#### 3.2 Assessment strategy for EMS/SCADA/Real-time

*(Inventory process or the method used to identify inventory – walk through, BOM combinations etc. Identification of all possible components, all digital or only the critical digital systems. Definition of critical (i.e., business critical or mission critical - keep the lights on)*

- All electronic hardware and all software were included on the inventory list.
- All EMS/SCADA hardware and software that was time/date aware was deemed to be mission critical.

*(Assessment strategy/testing- relied on vendor information, sample testing, simple testing – reduced data set etc.)*

- Although vendor readiness information was researched, by way of communication and by vendor websites, etc., vendor assurances were not deemed sufficient to declare Y2k Readiness.
- All mission-critical devices and software programs were thoroughly tested to assure Y2k Readiness.

*(Critical supplier approach - Method used to identify critical suppliers; e.g. purchase records etc. (power suppliers, fuel suppliers, water suppliers, phone service, and other vendor strategy)*

- The suppliers of the EMS and RTUs were well known.
- The telecommunications department contacted the telecommunications suppliers for discussion, analysis and assurances.

#### 3.3 Test strategy and procedures for EMS/SCADA/Real-time

*(Risk based priority test strategy - highest business impact tests first and more comprehensive tests applied. Lower impact not tested at all or at a less detailed level or other strategies)*

- All EMS/SCADA hardware and software was tested for a multitude of critical date changes.

*(Testing procedures - Compliance assessment testing: test date and date transitions testing; Application tests; validation tests (of remediation work); Differentiation between large and complex systems and small, stand-alone systems with embedded chips; Integrated tests or unit tests; Test audits)*

- About 17 major and minor Y2k dates were tested including the 12/31/99, 2/28/00 and 2/29/00 rollovers.
- It was found that one type of RTU required a ROM chip upgrade to become Y2k Ready. All such RTUs were remediated.
- Once vendor recommended upgrades were performed on existing EMS/SCADA software, follow-up tests found no problems

### **3.4 Remediation strategy for EMS/SCADA/Real-time**

*(Fix or replace; in-house versus outsourcing; live with the problem and adjust settings manually; differentiation between large and complex systems and small stand-alone units)*

1. Replace ROM chips in one type of RTU.
2. Implement vendor recommended software upgrades on the EMS/SCADA system.
3. Then thoroughly test.

### **3.5 Customer information and survey responses [Omitted for Phase II]**

*(Active customer contacts to avoid irrational behavior of customers at the transition from year 1999 to 2000; response to requests for information on Y2K readiness from others such as local phone company, hospitals etc.)*

### **3.6 Quality control to ensure that Y2K readiness is achieved and maintained**

*(Role of inside auditors; outside auditors, NERC test participation, procedures in place to ensure that readiness state is not lost as a result of warranty changes, upgrades etc.)*

- Auditors, both internal and external, were used on a regular basis. Recommendations from such audits were incorporated into the Y2k program.
- Formal sign-off procedures were followed to assure that no items “fell through the cracks”.
- A formal clean management program is in place.
- One issue discussed, external to the EMS/SCADA area, is the concern over the Y2k Readiness of new acquisitions by the corporation – an on-going process at this organization.

### **3.7 Contingency plans for EMS/SCADA/Real-time**

*(Horizon for plan, trial of plan procedures, special staffing and manual controls at the transition, self-generation and special provisions to deal with large load swings, dependency on public communication systems and preparedness for phone system – including cellular system –overloads etc.)*

- A very detailed, thorough contingency plan is in place and has been trained and drilled.
- Plans are in place to staff many critical, normally unattended, locations during the 12/31/99 rollover period.
- Plans for the control center contingency are so elaborate that they even detail how the emergency cars are to be parked, and the separate routes be used from the control center to emergency backup site to avoid the possibility of a traffic jam preventing completion of the trip.

## 4. Position of the Utility at Time of Assessment

### 4.1 General position on EMS/SCADA/Real-time

*(Progress on schedule towards Y2K readiness; budget spent versus projected, remaining work; criticality of this work; participation in April 9 NERC Exercise; opinions of auditors – if any etc.)*

- The EMS/SCADA system and the RTUs were Y2k Ready at the time of this assessment.

### 4.2 Review of plans and relevant documentation

*(Existence of documents; errors and omissions in documents; vendor/supplier readiness information etc.)*

- Extensive and thorough documentation was made available for inspection by this review team.
- No Gaps were encountered.

### 4.3 Review of test records

*(Existence of test procedures; test result documentation; completeness on testing to known problem dates, test procedures likely to catch the known problems; reliance on vendor information or actual testing of mission-critical systems, use of test data from sources such as EPRI, other utilities or other organizations with relevant data etc.)*

- Only one minor documentation discrepancy was observed in a matter of system operator training on a new software program on the EMS. The decision had been made to delay the training until Nov. 1999, but the official inventory still showed the date prior to the delay decision.

### 4.4 Retest of selected equipment/systems

*(Selection process – assessors allowed to select or utility selection, repeat of test generated, same results as when utility (or tester) did the test last time etc.)*

Two tests were performed.

1. An RTU of the type that had its ROM replaced was isolated on its communications line to a test set. The three critical Y2k rollover dates (12/31/99, 2/28/00, and 2/29/00) were sent to the RTU, time was allowed for the rollover, and then the RTU was interrogated for time, which came back correct.

2. The second test took place on the utility's homegrown interchange scheduling software. Three transactions were set up to bridge the 12/31/99 rollover. The software and network servers performed correctly in all respects.

## 5. Interviews

### 5.1 Interview #1 – *name and title of person interviewed*

*(Impressions from interview; concerns and or convictions and reasons for these)*

- Title:      Manager, Operating Planning & Analysis, System Planning & Operations
- This individual is very comfortable that the company and system operations in particular, are Y2k ready.
  - In addition, he is sure that they have a mitigation strategy for all worst-case credible scenarios.

### 5.2 Interview #2 –

- Title:      Lead Telecom Analyst, Telecommunications
- This individual was personally involved in testing and certifying telecommunications facilities including LAN/WAN facilities as well as voice and data facilities.
  - He is convinced that all these facilities are Y2k Ready and will perform as intended on all Y2k dates.
  - His only Y2k concerns are external to the company – public reactions.

### 5.3 Interview #3 –

- Title:      Manager, System Operating Center, System Planning & Operating
- This individual has a concern about communications using alternate methods (satellite phone) in the event of a loss of primary communications facilities that he doesn't expect.
  - From the point of view of operating the power system, he looks at the 12/31/99 rollover date as just another day in system operations where the unanticipated event is expected!
  - He is also somewhat concerned about the potential for irrational public behavior and sabotage.

### 5.4 Interview #4 –

- Title:      Vice President, Business Initiatives
- This individual, who worked with and approved much of the contingency plan, feels very comfortable with the company's Y2k readiness.
  - He has no Y2k concerns either inside or outside the company.

## 5.5 Key Concerns of Utility Managers

*(Include anything that may be helpful in understanding the reasons for the concern)*

- Predominant concerns were for public and media activities external to the company. In particular, the potential for irrational behavior on the part of the public is an imponderable.

## **6. Key People Participating in the Assessment**

### **6.1 Utility people (Titles only)**

Program Director, Information Management, Year 2000 Program  
Project Manager, Information Management, Year 2000 Program  
Power Generation IT Manager  
Manager, Operating Planning & Analysis, System Planning & Operations  
EMS Migration Project Manager, System Planning & Operations  
Manager, System Operating Center, System Planning & Operations  
Lead Telecom Analyst, Telecommunications  
Vice President, Business Initiatives  
Engineer

## **7. EMS/SCADA/Real-time Comments**

### **7.1 Preparations**

- This organization has thoroughly prepared and tested its EMS/SCADA and RTU systems.
- Its personnel are trained in the use of the equipment and the contingency plans associated with the potential failure of critical equipment or processes on the Y2k dates.

### **7.2 Vendor Responses**

- Although vendor responses and assurances were solicited and received, all mission-critical devices and processes that could be tested were tested.

### **7.3 Testing**

- EMS/SCADA Y2k testing was performed and documented for 17 Y2k dates.

### **7.4 Sign-off/Certification**

- A formal sign-off procedure is in place and was followed.

## Profile of Organization Visited

Site Number 7

### 1. Year 2000 Readiness

*Select Level 1, 2 or 3 from below (delete those that do not apply)*

Based on the information gathered from the on-site review, the assessor is to make an evaluation of the organization's EMS/SCADA/Real-time systems ability to meet readiness dates for all mission-critical functions. The assessor will assign an overall level of risk based on the following:

- ☒ Level 3: Organization should meet a readiness date of 10/31/99 for EMS/SCADA/Real-time systems and will be Y2K ready by 12/31/99.

The assessors reached this conclusion based on the following insights:

- The EMS/SCADA system is Y2k Ready at the time of this review.
- Good top management support of the Y2k program.
- The credibility of the Y2k Readiness is high since every mission-critical device that could be tested was tested.
- A good contingency plan.
- The organization has proactively communicated its Y2k program efforts to its customers and the general public.
- Participated in both the April and September, 1999 NERC/region Y2k drills.

## 2. Profile of Utility

### 2.1 General statistical information

Utility Type:	Investor Owned Utility
Annual Gross Revenue (Year):	\$2,509,490,168 (1997)
Control Area	Yes
System peak Demand:	4405 MW
Demand Characteristics:	
Number of Customers	577,571
Number of Residential Customers	514,753
Number of Commercial Customers	62,534
Number of Industrial Customers	284
Number of Other Customers	0
Number of Substations:	150

### 2.2 Local Y2K environment

*(Include relevant information about the utility such as what fuel base is used for generation, black start capability, types of loads served by the utility, critical loads, dependence on power from others, degree of integration with other utilities etc.)*

- The company has sufficient generation to provide all of its customers' power requirements.
- Although it owns a large nuclear plant, the predominance of its generation is coal fired with the ability to switch to natural gas for fuel at many locations. It has a number of combustion turbines, many of which have black start capability.
- It is a control area and participates in reserve sharing with other utilities in its Regional Council Region.



### 3. Year 2000 Readiness History

#### 3.1 Start of Y2K preparation

*(When did the preparation begin and at whose initiative. What was the budget and personnel allocated to achieve Y2K readiness, key people in Y2K project with reporting – organization chart if available to be attached)*

- The Y2k program began in late 1996 at the initiative of the CEO.
- The project was budgeted at \$19,300,000 of which about \$15,000,000 has been recorded as spent to date.
- Each business unit reported directly to the CEO on Y2k matters. Status Y2k reports were prepared monthly for each business unit, a report went to the CEO and then to the Board of Directors every two months.

*(Role of outside consultants and auditors)*

- Only the routine 10Q review by the corporate auditor.

#### 3.2 Assessment strategy for EMS/SCADA/Real-time

*(Inventory process or the method used to identify inventory – walk through, BOM combinations etc. Identification of all possible components, all digital or only the critical digital systems. Definition of critical (i.e., business critical or mission critical - keep the lights on)*

- It was recognized that the old EMS (whose supplier is no longer in the EMS business) could not practically be made Y2k Ready. A decision was made to replace the EMS. The new EMS was built in-house by company employees using Y2k Ready/Complaint software from Microsoft and Oracle.
- One of each RTU type was tested and found to be a recipient of time/date from the Master station.

*(Assessment strategy/testing- relied on vendor information, sample testing, simple testing – reduced data set etc.)*

- Where it was possible to test for Y2k Readiness, mission-critical devices were tested after examination of all material available from the vendor.
- In the case where testing was not possible, every possible review of vendor information, the EPRI database and contact with other utilities was made to verify/validate the vendor's claims.

*(Critical supplier approach - Method used to identify critical suppliers; e.g. purchase records etc. (power suppliers, fuel suppliers, water suppliers, phone service, and other vendor strategy)*

- The identified mission-critical processes were examined for external inputs to identify critical supplier needs.

### 3.3 Test strategy and procedures for EMS/SCADA/Real-time

*(Risk based priority test strategy - highest business impact tests first and more comprehensive tests applied. Lower impact not tested at all or at a less detailed level or other strategies)*

1. Thoroughly test the EMS/SCADA system for critical dates.
2. Review software vendor sites to remain current on any Y2k problems found with the software.
3. One of each RTU type was tested, but were found to be recipients of time from the Master station.
4. The key dates tested were the 12/31/99 to 1/1/00 and 2/28/00 to 2/29/00 rollovers.

*(Testing procedures - Compliance assessment testing: test date and date transitions testing; Application tests; validation tests (of remediation work); Differentiation between large and complex systems and small, stand-alone systems with embedded chips; Integrated tests or unit tests; Test audits)*

- The integrated EMS/SCADA system with its front-end processors and a group of RTUs were tested as an integral system.

### 3.4 Remediation strategy for EMS/SCADA/Real-time

*(Fix or replace; in-house versus outsourcing; live with the problem and adjust settings manually; differentiation between large and complex systems and small stand-alone units)*

- None found to be needed – new system.

### 3.5 Customer information and survey responses [Omitted for Phase II]

*(Active customer contacts to avoid irrational behavior of customers at the transition from year 1999 to 2000; response to requests for information on Y2K readiness from others such as local phone company, hospitals etc.)*

### 3.6 Quality control to ensure that Y2K readiness is achieved and maintained

*(Role of inside auditors; outside auditors, NERC test participation, procedures in place to ensure that readiness state is not lost as a result of warranty changes, upgrades etc.)*

- A member of the internal audit department was on the Y2k Team.
- A clean management process in place to ensure readiness status is maintained.
- The company participated in both NERC Y2k drills.

### 3.7 Contingency plans for EMS/SCADA/Real-time

*(Horizon for plan, trial of plan procedures, special staffing and manual controls at the transition, self-generation and special provisions to deal with large load swings, dependency on public communication systems and preparedness for phone system – including cellular system –overloads etc.)*

- The contingency plan for the company includes loss of all data telemetry to the EMS as well as loss of the EMS. These look like the same contingency!
- Backup communications methods and location of personnel at strategic locations is part of the recovery for this contingency along with manual calculations for ACE, and satellite communications to neighboring utilities and the regional security coordinator.

## 4. Position of the Utility at Time of Assessment

### 4.1 General position on EMS/SCADA/Real-time

*(Progress on schedule towards Y2K readiness; budget spent versus projected, remaining work; criticality of this work; participation in April 9 NERC Exercise; opinions of auditors – if any etc.)*

- The EMS/SCADA was ready at the time of this review.
- The books show that \$15,000,000 has been spent to date on the company Y2k program; \$19,300,000 was budgeted.
- The company participated in both the 4/9/99 and 9/8-9/99 NERC Y2k drills.

### 4.2 Review of plans and relevant documentation

*(Existence of documents; errors and omissions in documents; vendor/supplier readiness information etc.)*

- The documentation of the EMS/SCADA Y2k readiness is thorough. It includes thorough vendor information for 19 suppliers of hardware and software that comprise the EMS.

### 4.3 Review of test records

*(Existence of test procedures; test result documentation; completeness on testing to known problem dates, test procedures likely to catch the known problems; reliance on vendor information or actual testing of mission- critical systems, use of test data from sources such as EPRI, other utilities or other organizations with relevant data etc.)*

- The test record was a simple two-page document stating that testing had successfully been completed.

### 4.4 Retest of selected equipment/systems

*(Selection process – assessors allowed to select or utility selection, repeat of test generated, same results as when utility (or tester) did the test last time etc.)*

- The company volunteered to set up their “reserve” EMS system with an isolated front-end processor and a live RTU to demonstrate the Y2k Readiness of its system.
- In addition to the 12/31/99 to 1/1/00 rollover proposed by the company, the reviewers requested that the 2/28/00 to 2/29/00 and 2/29/00 to 3/1/00 rollovers be tested.
- All tests were successful.

## 5. Interviews

### 5.1 Interview #1 – *name and title of person interviewed*

*(Impressions from interview; concerns and or convictions and reasons for these)*

Title:       Manager – Generation Services

- This individual is fully convinced that the company and EMS are Y2k Ready at this time.
- He has no Y2k readiness concerns.
- He reviewed and provided feedback to the contingency planning process, and feels that the contingency plan is thorough and complete.

## 5.2 Interview #2 –

Title: Supervisor – Transmission Services

- This individual is fully convinced that the company and the EMS are Y2k Ready at this time.
- He participated in the contingency planning and review process, and is comfortable that the contingency plan is thorough and complete.

## 5.3 Key Concerns of Utility Managers

*(Include anything that may be helpful in understanding the reasons for the concern)*

- One of the managers had no Y2k concerns. The other's only Y2k Readiness concerns are from outside the company.
- He is concerned about public reaction to events that they will associate (incorrectly) with Y2k.
- He is also concerned about the Y2k readiness of the Municipal and Cooperative utilities in his region.

## 6. Key People Participating in the Assessment

### 6.1 Utility people (Titles only)

Supervisor – Information Technology

Manager – Generation Services

Supervisor –Transmission Services

Operations Research Specialist

Group Leader, EMS Support

Electric Supply Systems Specialist

## 7. EMS/SCADA/Real-time Comments

### 7.1 Preparations

- The EMS is a homegrown implementation. It uses off-the-shelf shrink-wrapped products as its foundation. It is programmed in C++ and JAVA.
- They have an excellent trail of vendor documents that attest to the Y2k Readiness of the products being used in their EMS.
- They stated that four of the large worldwide EMS vendors have paid them a visit to see what this company has put together “without their help”!

### 7.2 Vendor Responses

- The utility received good cooperation and information from most vendors. One RTU vendor, however, was difficult to deal with and never seemed to provide promised information in a timely manner.

### 7.3 Testing

- The company tested its self-defined critical dates on the EMS. During our visit, we “helped” them to test the two February 2000 dates that the visit team feels are also critical Y2k dates.
- All retests were successful.

## **7.4 Sign-off/Certification**

None observed.

# Profile of Organization Visited

Site Number 8

## 1. Year 2000 Readiness

*Select Level 1, 2 or 3 from below (delete those that do not apply)*

**Based on the information gathered from the On Site Review, the assessors evaluated the organization's ability to meet the readiness dates for all mission-critical functions. The assessors assigned an overall level of risk as follows:**

☒ Level 3: Organization should meet NERC Y2K readiness date (10/31/99) and will be Y2K ready by 12/31/99.

The assessors reached this conclusion based on the following insights:

- The EMS/SCADA system is Y2k ready at the time of this review
- The Y2k Program Manager is an officer reporting to Board Of Directors on Y2k
- Adequate budget for Y2k program
- A highly motivated and competent Y2k team
- Participated in 9/8-9/99 NERC Y2k drill with good results
- Both internal and external Y2k audits are performed regularly
- Clean management is practiced to maintain Y2k Readiness

## 2. Profile of Utility

### 2.1 General statistical information

Utility Type:	Investor Owned Utility
Annual Gross Revenue (Year):	\$2,063,900 (1998)
Control Area	No
System peak Demand:	5,769 (summer)
Demand Characteristics:	
No. of Customers	672,139
No. of Residential Customers	601,402
No. of Commercial Customers	70,551
No. of Industrial Customers	11
No. of Other Customers	175
Number of Substations (T/D):	18/103

### 2.2 Local Y2K environment

*(Include relevant information about the utility such as what fuel base is used for generation, black start capability, types of loads served by the utility, critical loads, dependence on power from others, degree of integration with other utilities etc.)*

- No nuclear, predominately coal-fired equipment.
- Demand includes almost no industrial customers, just residential and commercial.
- Company has been a member of a tight power pool for many years.

### 3. Year 2000 Readiness History

#### 3.1 Start of Y2K preparation

*(When did the preparation begin and at whose initiative. What was the budget and personnel allocated to achieve Y2K readiness, key people in Y2K project with reporting – organization chart if available to be attached)*

- Project started in 1995 and originated in the IT department.
- The budget was at one point in time up to \$13.8M but as recently reduced to \$12.1M.
- The Y2K team leader is an officer of the Company and reports to the BOD on Y2K matters.

*(Role of outside consultants and auditors)*

- The firm used for financial audits is also reporting to the BOD on progress on resolving Y2K issues.
- An outside consulting firm helped develop the contingency plan.

#### 3.2 Assessment strategy for EMS/SCADA/Real-time

*(Inventory process or the method used to identify inventory – walk through, BOM combinations etc. Identification of all possible components, all digital or only the critical digital systems. Definition of critical (i.e., business critical or mission critical - keep the lights on)*

- The method used to build the inventory lists varied from business unit to business unit. Power plants used walk-through methods whereas the T&D systems used expert know-how. The substations are highly standardized so actual walk-throughs of all stations was not deemed necessary.
- Leased lines only used for some distribution stations.
- Communication system equipment was identified through physical inventory. The same for SCADA systems.

*(Assessment strategy/testing- relied on vendor information, sample testing, simple testing – reduced data set etc.)*

- All mission-critical and high-priority systems have been tested.
- Medium- and low-priority systems also were sometimes tested despite vendor information and assurances.
- EPRI database available to Company.

*(Critical supplier approach - Method used to identify critical suppliers; e.g. purchase records etc. (power suppliers, fuel suppliers, water suppliers, phone service, and other vendor strategy)*

- Accounts payable was used to identify vendors (6,000 identified). Information from past 3 years used to capture all vendors/suppliers.

#### 3.3 Test strategy and procedures for EMS/SCADA/Real-time

*(Risk based priority test strategy - highest business impact tests first and more comprehensive tests applied. Lower impact not tested at all or at a less detailed level or other strategies)*

- Integrated tests done for the SCADA/EMS system.

*(Testing procedures - Compliance assessment testing: test date and date transitions testing; Application tests; validation tests (of remediation work); Differentiation between large and complex systems and small, stand-alone systems with embedded chips; Integrated tests or unit tests; Test audits)*

- Test procedures in general based on GM's approach. 17 dates tested.

### **3.4 Remediation strategy for EMS/SCADA/Real-time**

*(Fix or replace; in-house versus outsourcing; live with the problem and adjust settings manually; differentiation between large and complex systems and small stand-alone units)*

- Vendor provided upgrades for SCADA/EMS.
- DCS systems in plants were upgraded by vendors.

### **3.5 Customer information and survey responses [Omitted for Phase II]**

*(Active customer contacts to avoid irrational behavior of customers at the transition from year 1999 to 2000; response to requests for information on Y2K readiness from others such as local phone company, hospitals etc.)*

### **3.6 Quality control to ensure that Y2K readiness is achieved and maintained**

*(Role of inside auditors; outside auditors, NERC test participation, procedures in place to ensure that readiness state is not lost as a result of warranty changes, upgrades etc.)*

- Risk management consulting firm used to help with assessment of risks.
- Insurance company questionnaire filled out; this is a self-assessment process.
- Company participated in NERC drills.
- Clean management used to maintain readiness.

### **3.7 Contingency plans for EMS/SCADA/Real-time**

*(Horizon for plan, trial of plan procedures, special staffing and manual controls at the transition, self-generation and special provisions to deal with large load swings, dependency on public communication systems and preparedness for phone system – including cellular system –overloads etc.)*

- Company has a well-developed communication system and does not depend on public communication links for most of its operations.
- Coordination with local emergency response organizations has been established for traffic and crowd control in conjunction with the New Year celebrations.

## **4. Position of the Utility at Time of Assessment**

### **4.1 General position on EMS/SCADA/Real-time**

*(Progress on schedule towards Y2K readiness; budget spent versus projected, remaining work; criticality of this work; participation in April 9 NERC Exercise; opinions of auditors – if any etc.)*

- SCADA/EMS system is Y2K ready and passed retests.



## 4.2 Review of plans and relevant documentation

*(Existence of documents; errors and omissions in documents; vendor/supplier readiness information etc.)*

## 4.3 Review of test records

*(Existence of test procedures; test result documentation; completeness on testing to known problem dates, test procedures likely to catch the known problems; reliance on vendor information or actual testing of mission-critical systems, use of test data from sources such as EPRI, other utilities or other organizations with relevant data etc.)*

- Test records were not “clean” because errors in test procedures had been corrected by testers.
- Test results were not checked by managers/supervisors because tests were run by the experts themselves. However, the test records were deemed to have reasonable quality and accuracy based on sampling and review of tests with the technical experts.

## 4.4 Retest of selected equipment/systems

*(Selection process – assessors allowed to select or utility selection, repeat of test generated, same results as when utility (or tester) did the test last time etc.)*

- Test was run using a backup computer system with one remote unit in an operating substation.
- Trend logs, tagging and other normal operations were observed with no Y2K or other functional problems seen.
- Tags remained in place even after date rollover and trend and event records continued with proper time handling of time.

## 5. Interviews

### 5.1 Interview #1 – *name and title of person interviewed*

*(Impressions from interview; concerns and or convictions and reasons for these)*

Title: Principal Engineer, Transmission Engineering and Construction

- Security of dial up links to digital relays discussed.
- No major concerns.

### 5.2 Interview #2 –

Title: Manager telecommunications

- Feeling of overconfidence was of some concern.

### 5.2 Interview #3 –

Title: Manager T&D Operations

- Post rollover of relays of some concern because of the risk for inadvertent trips.
- There is a concern with having people in substations because this can lead to accidental operation of breakers.

### **5.3 Key Concerns of Utility Managers**

*(Include anything that may be helpful in understanding the reasons for the concern)*

- Traffic jams caused by New Year's Eve celebrations could be a problem for utility crews.

## **6. Key People Participating in the Assessment**

### **6.1 Utility people (Titles only)**

Vice President and Chief Information Officer  
Manager, Transmission System Operations  
Manager, Telecommunications Division  
Principal Engineer, Transmission Engineering & Construction  
General Manager, Internal Audit  
Manager, Control Center Systems  
IT Project Coordinator

## **7. EMS/SCADA/Real-time Comments**

### **7.1 Preparations**

- See 4.4 above

### **7.2 Vendor Responses**

- See 3.4 above

### **7.3 Testing**

- See 4.4 above

### **7.4 Sign-off/Certification**

- See 4.3 above

# Profile of Organization Visited      Site Number 9

## 1. Year 2000 Readiness

*Select Level 1, 2 or 3 from below (delete those that do not apply)*

Based on the information gathered from the on-site review, the assessor is to make an evaluation of the organization's EMS/SCADA/Real-time systems ability to meet readiness dates for all mission-critical functions. The assessor will assign an overall level of risk based on the following:

- ☒ Level 3:      Organization should meet a readiness date of 10/31/99 for EMS/SCADA/Real-time systems and will be Y2K ready by 12/31/99.

The assessors reached this conclusion based on the following insights:

- The Y2k Project Management reports directly to the President of the Company on Y2k issues ensuring adequate project focus and budget.
- Use of an Executive Y2k Steering Committee aids in keeping the Y2k project at a high level of awareness across the company's business units.
- Good Y2k project plan with detailed standard inventory and test procedures
- Tested EMS/SCADA at one location and then matched the other two EMS/SCADA systems to its hardware and software revision levels
- The credibility of the Y2k Readiness is high, since every mission-critical device that could be tested, was tested.
- Both internal and external audits were performed.

## 2. Profile of Utility

### 2.1 General statistical information

Utility Type:	Investor Owned Utility
Annual Gross Revenue (Year):	\$12.6 billion
Control Area	Yes - 2
System peak Demand:	1941 MW
Demand Characteristics:	
Number of Customers	459,043
Number of Residential Customers	396,912
Number of Commercial Customers	57,178
Number of Industrial Customers	339
Number of Other Customers	4,614
Number of Substations:	485

### 2.2 Local Y2K environment

*(Include relevant information about the utility such as what fuel base is used for generation, black start capability, types of loads served by the utility, critical loads, dependence on power from others, degree of integration with other utilities etc.)*

- Internal generation is about 40% coal and 60% natural gas.
- One of the three operating companies is predominately rural in nature and is a net buyer of energy. The other two operating companies are essentially capable of self-generation if economic.
- The operating companies are well integrated with their neighboring utilities, belong to a power pool and participate in NERC activities through their regional councils.

### 3. Year 2000 Readiness History

#### 3.1 Start of Y2K preparation

*(When did the preparation begin and at whose initiative. What was the budget and personnel allocated to achieve Y2K readiness, key people in Y2K project with reporting – organization chart if available to be attached)*

- The Y2k program had its genesis in a 1994 reengineering of all processes within the company.
- In August 1997, the audit department started getting information on embedded systems.
- In November 1997, a seminar identified Y2k issues. The soon-to-become Y2k Project Manager put together a white paper describing the required Y2k efforts.
- In February 1998, a task force of about 20 people started the inventory process. It didn't go very well, and in June 1998, a contractor was hired to perform a thorough inventory. Inventory was complete and priorities had been established by 9/98.
- The contingency planning process was begun in February 1998.
- The task force grew to 150 people during the height of the activity.

*(Role of outside consultants and auditors)*

- An outside firm was engaged to perform the Y2k inventory.
- An outside firm was engaged to perform Y2k audits.
- The company's internal audit department also performed audits of the Y2k program.

#### 3.2 Assessment strategy for EMS/SCADA/Real-time

*(Inventory process or the method used to identify inventory – walk through, BOM combinations etc. Identification of all possible components, all digital or only the critical digital systems. Definition of critical (i.e., business critical or mission critical - keep the lights on)*

- The new EMS/SCADA system was under test when it was decided to use a closed environment to perform Y2k testing and remediation.
- With an isolated RTU, full testing of every software and hardware time and date function was performed, and fixes were made as needed.
- The final software and hardware revision levels were then propagated to the other two new Systems.
- Because all RTUs are identical and do not keep local time, only the one RTU was tested.

*(Assessment strategy/testing- relied on vendor information, sample testing, simple testing – reduced date set etc.)*

- For mission-critical facilities and processes, vendor information was sought and examined, but all mission-critical facilities were tested and validated by company personnel.
- For non-mission-critical inventory items, vendor information and assurances were accepted if testing was not possible.

*(Critical supplier approach - Method used to identify critical suppliers; e.g. purchase records etc. (power suppliers, fuel suppliers, water suppliers, phone service, and other vendor strategy)*

- Critical suppliers were identified by examination of processes and purchase records.

### **3.3 Test strategy and procedures for EMS/SCADA/Real-time**

*(Risk based priority test strategy - highest business impact tests first and more comprehensive tests applied. Lower impact not tested at all or at a less detailed level or other strategies)*

- Full Y2k testing on one isolated EMS/SCADA with RTU.
- The other two systems were then remediated to the same hardware and software revision levels.

*(Testing procedures - Compliance assessment testing: test date and date transitions testing; Application tests; validation tests (of remediation work); Differentiation between large and complex systems and small, stand-alone systems with embedded chips; Integrated tests or unit tests; Test audits)*

- All major Y2k transition dates were tested.
- They also tested both spring and fall daylight savings transitions for 1999.
- In addition, they tested the 1/1/2000 to 1/2/2000 transition.

### **3.4 Remediation strategy for EMS/SCADA/Real-time**

*(Fix or replace; in-house versus outsourcing; live with the problem and adjust settings manually; differentiation between large and complex systems and small stand-alone units)*

- Because the EMS/SCADA was on a test bed for factory acceptance, the remediation work was performed primarily by the EMS vendor at the test location.

### **3.5 Customer information and survey responses [Omitted for Phase II]**

*(Active customer contacts to avoid irrational behavior of customers at the transition from year 1999 to 2000; response to requests for information on Y2K readiness from others such as local phone company, hospitals etc.)*

### **3.6 Quality control to ensure that Y2K readiness is achieved and maintained**

*(Role of inside auditors; outside auditors, NERC test participation, procedures in place to ensure that readiness state is not lost as a result of warranty changes, upgrades etc.)*

- Both internal and external audits were performed during the Y2k program.
- The company participated in both NERC Y2k drills.
- Clean management consists of retesting any changes for Y2k Readiness.

### **3.7 Contingency plans for EMS/SCADA/Real-time**

*(Horizon for plan, trial of plan procedures, special staffing and manual controls at the transition, self-generation and special provisions to deal with large load swings, dependency on public communication systems and preparedness for phone system – including cellular system –overloads etc.)*

- Contingency plans include staffing at a multitude of locations not normally attended, including substations needed for black start capability.
- All steam-driven generators will be on-line, and staff will be in place to bring on quick start units, if needed.
- Communications facilities have three levels of backup – radio, satellite telephone, and cellular telephone.

## 4. Position of the Utility at Time of Assessment

### 4.1 General position on EMS/SCADA/Real-time

*(Progress on schedule towards Y2K readiness; budget spent versus projected, remaining work; criticality of this work; participation in April 9 NERC Exercise; opinions of auditors – if any etc.)*

- The EMS/SCADA is Y2k Ready at the time of this review.
- The entire Y2k Program was budgeted at \$2,880,000 with about \$901,000 spent by July, 1999.
- The company participated in the NERC September, 1999 drill with success and a few lessons were learned.

### 4.2 Review of plans and relevant documentation

*(Existence of documents; errors and omissions in documents; vendor/supplier readiness information etc.)*

- The company has well documented plans, including a standard inventory and standard test procedures. The test procedure form includes fields to describe the consequences of not fixing components that fail their Y2k test.
- The Y2k information on mission-critical elements gathered from vendors was thorough and well organized.

### 4.3 Review of test records

*(Existence of test procedures; test result documentation; completeness on testing to known problem dates, test procedures likely to catch the known problems; reliance on vendor information or actual testing of mission-critical systems, use of test data from sources such as EPRI, other utilities or other organizations with relevant data etc.)*

- The trail of standard test records to the inventory list to the database was straightforward and complete.

### 4.4 Retest of selected equipment/systems

*(Selection process – assessors allowed to select or utility selection, repeat of test generated, same results as when utility (or tester) did the test last time etc.)*

- Not performed, unwilling to jeopardize real-time operations.

## 5. Interviews

### 5.1 Interview #1 – *name and title of person interviewed*

*(Impressions from interview; concerns and or convictions and reasons for these)*

Title: Director, Transmission Operations, Energy Delivery

- He is confident that all equipment and processes in his jurisdiction are Y2k Ready now.
- Somewhat concerned about things that are not in his control, such as communications.
- He indicated that contingency training is on-going at this time.

## 5.2 Interview #2 –

Title: Director, Transmission Operations

- He is confident that the system is Y2k ready now because every mission-critical element was tested.
- He is of the opinion that the entire Y2k issue may have been overblown.

## 5.3 Key Concerns of Utility Managers

*(Include anything that may be helpful in understanding the reasons for the concern)*

- Media hype, public reaction and maybe sabotage.

## 6. Key People Participating in the Assessment

### 6.1 Utility people (Titles only)

Director, Year 2000 Project

Director, Transmission Operations, Energy Delivery

Director, Transmission Operations

Director, Technical Services, SCADA/EMS

SCADA/EMS Engineer

## 7. EMS/SCADA/Real-time Comments

### 7.1 Preparations

- The ability to thoroughly test a new EMS/SCADA on the test floor provided an enviable environment in which to test the equipment for Y2k issues. When this process was complete, their other two EMS/SCADA systems (in different states) were brought up to the same hardware and software revision levels.

### 7.2 Vendor Responses

- The EMS vendor worked very cooperatively with the company during the testing process described above.

### 7.3 Testing

- Testing was thoroughly documented, but retesting was not possible at the time of our visit.

### 7.4 Sign-off/Certification

## Profile of Organization Visited

Site Number 10

### 1. Year 2000 Readiness

Based on the information gathered from the On Site Review, the assessors evaluated the organization's ability to meet the readiness dates for all mission-critical functions. The assessors assigned an overall level of risk as follows:

- ☒ Level 2: Organization has some issues that cause concern for meeting NERC Y2K readiness date (10/31/99), but should be Y2K ready by 12/31/99. There is a need to continue to monitor the organization's EMS/SCADA/Real-time progress.

The assessors reached this conclusion based on the following insights:

- Need to complete remediation & testing of four remaining mission-critical items by 11/1/99.
- Good Y2K project plan with specific guidelines for inventory, assessment and testing.
- High-level corporate commitment to Y2K project.
- Made use of external & internal audits to ensure Y2K project readiness & consistency
- Tested all mission-critical devices & systems that could be tested.
- Need to complete Y2K contingency planning.
- Note: didn't meet 11/1/99 date for all four items under first listing above

## 2. Profile of Utility

### 2.1 General statistical information

Company Type:	<u>Independent Power Producer</u>
Annual Gross Revenue (Year):	<u></u>
Control Area	<u>No</u>
System peak Demand:	<u></u>
Demand Characteristics:	<u></u>
No. of Customers	<u></u>
No. of Residential Customers	<u></u>
No. of Commercial Customers	<u></u>
No. of Industrial Customers	<u></u>
No. of Other Customers	<u></u>
Number of Substations:	<u></u>

### 2.2 Local Y2K environment

- They have good relations with the utilities that purchase power from them. They try to work closely with them on all reliability issues.
- Company operates gas turbine power plants

## 3. Year 2000 Readiness History

### 3.1 Start of Y2K preparation

- Developed a centralized approach, with each plant responsible for actual work based on Y2K Guidelines. Y2K project manager works with each of the plants' personnel.



- Started formal project about 15 months ago. Weekly status updates combined with monthly project meetings for Y2K oversight.
- There were sufficient resources both budget and personnel to accomplish the Y2K project goals.
- Made use of external and internal audits for consistency and timeliness of project implementation.
- Quarterly reports to executive management and Board of Directors.

### **3.2 Assessment strategy for EMS/SCADA/Real-time**

- Used a central review of plant information for project consistency.
- Listed all digital devices in the inventory.
  - Used four classifications: digital, analog, non-processor, unknown.
  - Three levels for digital devices: critical, some impact, non essential
- Used letters and vendor web sites to determine initial device status.
- Device considered mission critical when its failure would directly affect the generation/production of electricity & lead to potentially non-recoverable consequences in the area of customer relations, revenue, safety and reliability.
- Tested all mission-critical devices and systems that could be tested.
- Worked closely with all critical suppliers of goods and services to determine their ability to supply goods and services during the Y2K transition.

### **3.3 Test strategy and procedures for EMS/SCADA/Real-time**

- Tested all mission-critical systems (DCS) that could be tested.
- During an outage tested DCS based on Guidelines. Used vendor for test support.

### **3.4 Remediation strategy for EMS/SCADA/Real-time**

- Based on vendor information and testing, used strategy of updating or replacement for remediation of DCS.

### **3.5 Customer information and survey responses [Omitted for Phase II]**

### **3.6 Quality control to ensure that Y2K readiness is achieved and maintained**

- Used outside auditors to audit a plant. Used internal staff for additional plant audits.
- Have a “clean management” system in place to assure continued Y2K readiness.

### **3.7 Contingency plans for EMS/SCADA/Real-time**

- Contingency plans still not completed. Need to get them completed.
- Each plant will have a contingency plan. Coordinated through Y2K project team.

## **4. Position of the Utility at Time of Assessment**

### **4.1 General position on EMS/SCADA/Real-time**

- Have four remaining mission-critical items to complete by 11/1/99.
- Budget for Y2K was not revealed.
- Training will be done during November and December for contingency plans.

### **4.2 Review of plans and relevant documentation**

- Made good use of central project documentation for project control. Made use of a central database and an Issues Log to track Y2K issues.
- Original project plan and guidelines for plant developed by a consultant.

### **4.3 Review of test records**

- Reviewed test records for a plant DCS. Records were complete.

### **4.4 Retest of selected equipment/systems**

- Unable to do retests without taking a plant off line, which was not feasible.

## **5. Interviews**

### **5.1 Interview #1**

Title: Manager of IS

- Confident they will be Y2K ready before end of the year.
- High level of involvement by management, plant managers serious about the Y2K work.
- External audit confirm work being done properly.
- Only concerns, was anything missed? Finish contingency plans.
- Feel comfortable with critical suppliers. Will increase some inventories.

### **5.2 Interview #2**

Title: Plant Manager

- Confident they will be able to operate through the Y2K transition. Believes they have a well-developed Y2K plan.
- Resources were made available to get the job done. People worked hard to complete the project.
- Some concern regarding critical suppliers ability to supply goods and services. Some concern with hackers getting into critical systems

### **5.3 Key Concerns of Utility Managers**

- Noted above

## **6. Key People Participating in the Assessment**

## **6.1 Utility people**

- 

## **6.2 Assessors**

# **7. EMS/SCADA/Real-time Comments**

## **7.1 Preparations**

- Preparations were thorough and complete.

## **7.2 Vendor Responses**

- Vendor support and response was good after some initial reluctance.

## **7.3 Testing**

- Testing was done on plant DCS using vendor support.

## **7.4 Sign-off/Certification**

- Required

**Profile of Organization Visited**Site Number 11**1. Year 2000 Readiness***Select Level 1, 2 or 3 from below (delete those that do not apply)*

**Based on the information gathered from the on-site review, the assessor is to make an evaluation of the organization's EMS/SCADA/Real-time systems ability to meet readiness dates for all mission-critical functions. The assessor will assign an overall level of risk based on the following:**

- ☒ Level 3: Organization should meet a readiness date of 10/31/99 for EMS/SCADA/Real-time systems and will be Y2k ready by 12/31/99.

The assessors reached this conclusion based on the following insights:

- All but one DCS system was Y2k ready at time of review. The remaining will be retested prior to 10/31/99. This plant is very similar to another plant, which is Y2k ready.
- Y2k Program Manager is officer of the company, who reports regularly to Board Of Directors on Y2k matters.
- Adequate database & documentation for Y2k program.
- External auditors performed review of Y2k work.
- NERC reports included non-mission-critical exceptions.
- Company did not participate in 4/9/99 and 9/9/99 drills and have no backup communication mechanism in case public phone system becomes unavailable.
- Clean management is incorporated in Y2k plans.
- Highly motivated and competent Y2k team.
- Contingency plan is quite thorough.

**2. Profile of Utility****2.1 General statistical information**

Company Type:	Independent Power Producer
Annual Gross Revenue (Year):	\$27.5M
Control Area	No
System peak Demand:	About 800 MW
Demand Characteristics:	
Number of Customers	
Number of Residential Customers	
Number of Commercial Customers	
Number of Industrial Customers	
Number of Other Customers	
Number of Substations:	

**2.2 Local Y2k environment**

- The IPP owns and operates power plants in several NERC regions. The gas-fired plants can run on oil, too.
- The company supplies steam to local industrial plants as well as electricity.

- The company operates the power plants as “islands” with no or little coordination with the local area controllers. Plant output is determined by contracts and is not dispatched.

### 3. Year 2000 Readiness History

#### 3.1 Start of Y2k preparation

- The organization's Y2k preparation project began in 1997. In mid-1998, the company assigned one of its officers to be a full-time project manager in mid-1998.
- The budget has been about \$1M.

#### *(Role of outside consultants and auditors)*

- An outside consultant, financial auditor and insurance company have each been used to provide guidance and critique the Y2k project.
- A legal review has also been conducted to determine possible exposure to Y2k related problems.

#### 3.2 Assessment strategy for EMS/SCADA/Real-time

*(Inventory process or the method used to identify inventory – walk through, BOM combinations etc. Identification of all possible components, all digital or only the critical digital systems. Definition of critical (i.e., business critical or mission critical - keep the lights on)*

- Each plant did its own inventory. However, collected information was shared with each plant, and errors and omissions were detected by looking at the differences among the plants. This process improved the accuracy of the inventory process.
- Five different criticalities were identified:  
Safety  
Mission critical  
Priorities 1, 2 and 3 with three as the lowest priority

*(Assessment strategy/testing- relied on vendor information, sample testing, simple testing – reduced data set etc.)*

- Vendor information was used to assess the Y2k readiness of the equipment.

*(Critical supplier approach - Method used to identify critical suppliers; e.g. purchase records etc. (power suppliers, fuel suppliers, water suppliers, phone service, and other vendor strategy)*

- Letters were sent to critical suppliers. Follow up letters were sent as needed to those not responding.
- Web site information has also been used.

#### 3.3 Test strategy and procedures for EMS/SCADA/Real-time

*(Risk based priority test strategy - highest business impact tests first and more comprehensive tests applied. Lower impact not tested at all or at a less detailed level or other strategies)*

- Testing is essentially limited to the digital control systems in the plants. Vendors have been used to remedy and to test these systems.

*(Testing procedures - Compliance assessment testing: test date and date transitions testing; Application tests; validation tests (of remediation work); Differentiation between large and complex systems and small, stand-alone systems with embedded chips; Integrated tests or unit tests; Test audits)*

- Testing has primarily been done for the 9/9/99, 12/31/99 and 2/28/00 rollovers. Some systems have had additional dates tested.

### **3.4 Remediation strategy for EMS/SCADA/Real-time**

*(Fix or replace; in-house versus outsourcing; live with the problem and adjust settings manually; differentiation between large and complex systems and small stand-alone units)*

- Vendors have upgraded DCS systems.
- Some non-mission-critical Y2k date problems will be ignored instead of remedied.

### **3.5 Customer information and survey responses [Omitted for Phase II]**

*(Active customer contacts to avoid irrational behavior of customers at the transition from year 1999 to 2000; response to requests for information on Y2k readiness from others such as local phone company, hospitals etc.)*

### **3.6 Quality control to ensure that Y2k readiness is achieved and maintained**

*(Role of inside auditors; outside auditors, NERC test participation, procedures in place to ensure that readiness state is not lost as a result of warranty changes, upgrades etc.)*

- Outside consultants have been used to assess the Y2k project. Insurance company and financial auditors have done the same.

### **3.7 Contingency plans for EMS/SCADA/Real-time**

*(Horizon for plan, trial of plan procedures, special staffing and manual controls at the transition, self-generation and special provisions to deal with large load swings, dependency on public communication systems and preparedness for phone system – including cellular system –overloads etc.)*

- Organization would prefer not to operate on New Year 2000, but will do so if customers are continuing to operate or if asked by the area controllers to operate.
- The plan includes additional personnel in plants that are going to be in operation.

## **4. Position of the Utility at Time of Assessment**

### **4.1 General position on EMS/SCADA/Real-time**

*(Progress on schedule towards Y2k readiness; budget spent versus projected, remaining work; criticality of this work; participation in April 9 NERC Exercise; opinions of auditors – if any etc.)*

- The DCS systems in all but one plant were Y2k ready. The remaining plant has been tested but the records are reported to be lost. This plant will be retested before 10/31/99. The completion of this work was reported to NERC during November 1999.
- The IPP has not participated in NERC drills.

## 4.2 Review of plans and relevant documentation

*(Existence of documents; errors and omissions in documents; vendor/supplier readiness information etc.)*

- Documents appeared to be complete for mission-critical components. However, some errors were found in classification and test status of non-critical equipment.

## 4.3 Review of test records

*(Existence of test procedures; test result documentation; completeness on testing to known problem dates, test procedures likely to catch the known problems; reliance on vendor information or actual testing of mission-critical systems, use of test data from sources such as EPRI, other utilities or other organizations with relevant data etc.)*

- Test records for all but one plant were available and in reasonable condition.

## 4.4 Retest of selected equipment/systems

*(Selection process – assessors allowed to select or utility selection, repeat of test generated, same results as when utility (or tester) did the test last time etc.)*

- No equipment could be retested without a plant outage. Thus, none was performed.

## 5. Interviews

### 5.1 Interview #1 – *name and title of person interviewed*

*(Impressions from interview; concerns and or convictions and reasons for these)*

Title: VP and Y2k Project leader  
Manager of operations  
Plant Manager and Assistant Plant  
Manager

### 5.3 Key Concerns of Utility Managers

*(Include anything that may be helpful in understanding the reasons for the concern)*

- Managers are concerned by the threat of vandalism.
- Any problems incurred on or around key dates will be blamed on Y2k
- Secure equipment and safe plant shut down if plants are islanded.

## **6. Key People Participating in the Assessment**

### **6.1 Utility people (Titles only)**

VP – Executive Sponsor  
Manager Operations  
Document Retention  
Corporate Treasury  
Legal Council  
Purchasing  
Technical Services, International  
Y2k Coordinator, Technical Services, Domestic  
Plant Manager and Assistant Manager  
Administrative Assistant

## **7. EMS/SCADA/Real-time Comments**

### **7.1 Preparations**

- The power plants use two different digital control systems. Assessment of the Y2k readiness of these for all of the plants was done in cooperation with the vendors.

### **7.2 Vendor Responses**

- Vendor correction or upgrading of the DCS systems has taken longer than desired. Lack of commitment of the vendors to correction of Y2k problems was mentioned as one reason for this delay.

### **7.3 Testing**

- As a result of the slower than desired response of the DCS system vendors, the testing of the last system to be remediated was conducted in the last several weeks prior to this review.
- The test records from one of the plants had been lost and retesting was scheduled for the week after this review.

### **7.4 Sign-off/Certification**

- The plant managers were responsible for performing tests based on a test protocol supplied by the Y2k team. Test results were sent from the plants to the Y2k team where the results were reviewed.
- No formal certification issued.



# Profile of Organization Visited      Site Number: 12

## 1. Year 2000 Readiness

*Select Level 1, 2 or 3 from below (delete those that do not apply)*

Based on the information gathered from the on-site review, the assessor is to make an evaluation of the organization's EMS/SCADA/Real-time systems ability to meet readiness dates for all mission-critical functions. The assessor will assign an overall level of risk based on the following:

- ☒ Level 3:      Organization should meet a readiness date of 10/31/99 for EMS/SCADA/Real-time systems and will be Y2k ready by 12/31/99.

The assessors reached this conclusion based on the following insights:

- The mission-critical DCS system is Y2k ready at the time of the review.
- Performed on-line integrated testing of mission-critical DCS.
- Excellent Y2k test plan and procedures.
- Good contingency plan.
- Clean management procedures (change control) in place, which ensures maintaining Y2k readiness.
- Good management of Y2k project at plant level.
- Good top-level management support for Y2k program.

## 2. Profile of Utility

### 2.1 General statistical information

Utility Type:	Independent Power Producer
Annual Gross Revenue (Year):	NA
Control Area	No
System peak Demand:	100 MW
Demand Characteristics:	
Number of Customers	1
Number of Residential Customers	
Number of Commercial Customers	
Number of Industrial Customers	
Number of Other Customers	
Number of Substations:	

### 2.2 Local Y2k environment

*(Include relevant information about the utility such as what fuel base is used for generation, black start capability, types of loads served by the utility, critical loads, dependence on power from others, degree of integration with other utilities etc.)*

- Gas fired CT but with local hydro plant in the vicinity of the plant suitable for black start of CT.
- High-pressure steam received from a local paper plant is retransmitted back to plant at a lower pressure suitable for process use. All of the electric output is delivered to local utility, which transmits it to a paper plant over short lines.

- Plant serves in principle only one load, but can in an emergency supply power to the local community if the production at the process plant is reduced.

### 3. Year 2000 Readiness History

#### 3.1 Start of Y2k preparation

*(When did the preparation begin and at whose initiative. What was the budget and personnel allocated to achieve Y2k readiness, key people in Y2k project with reporting – organization chart if available to be attached)*

- The organization began early preparations for Y2k preparations at a low level and subsequently launched a formal program in the spring of 1998 at the direction of the CEO.
- The plant is operated by the customer and all of the work has been performed by customer's people with oversight from the co-generation plant manager.
- This report is a composite for both organizations and not just limited to the owner's efforts.

*(Role of outside consultants and auditors)*

- Vendors for DCS (digital control system), SCADA systems and others were used under service contract to do testing and remediation work.
- A consultant was hired to do the balance of the plant instrumentation assessments.
- Auditors from parent company have been auditing the Y2k program.

#### 3.2 Assessment strategy for EMS/SCADA/Real-time

*(Inventory process or the method used to identify inventory – walk through, BOM combinations etc. Identification of all possible components, all digital or only the critical digital systems. Definition of critical (i.e., business critical or mission critical - keep the lights on)*

- BOM and walk-through was used to identify inventory. This included the DCS.

*(Assessment strategy/testing- relied on vendor information, sample testing, simple testing – reduced data set etc.)*

- Vendor information has been used when given, but all testable mission critical systems/components were tested to verify Y2k readiness.
- Most non-critical systems/components have been tested also.

*(Critical supplier approach - Method used to identify critical suppliers; e.g. purchase records etc. (power suppliers, fuel suppliers, water suppliers, phone service, and other vendor strategy)*

- The plant people know the major critical suppliers.
- Most critical is the high-pressure gas supply.

### 3.3 Test strategy and procedures for EMS/SCADA/Real-time

*(Risk based priority test strategy - highest business impact tests first and more comprehensive tests applied. Lower impact not tested at all or at a less detailed level or other strategies)*

- All hardware and software has been tested as components if possible.
- The final proof of Y2k readiness was a full operational test with the system running through the 12/31/99 transition as well as other critical dates in the year 2000.

*(Testing procedures - Compliance assessment testing: test date and date transitions testing; Application tests; validation tests (of remediation work); Differentiation between large and complex systems and small, stand-alone systems with embedded chips; Integrated tests or unit tests; Test audits)*

- Modified GM test procedures have been used.
- It was found that the UNIX rollover date in 2038 would lead to problems with all UNIX-based equipment, so this test date was omitted.
- Test strategy was adopted as appropriate for each type of equipment.

### 3.4 Remediation strategy for EMS/SCADA/Real-time

*(Fix or replace; in-house versus outsourcing; live with the problem and adjust settings manually; differentiation between large and complex systems and small stand-alone units)*

- Upgrading hardware and software was used to get the DCS operable in the year 2000 and beyond.
- This work was outsourced to the appropriate equipment vendor.

### 3.5 Customer information and survey responses [Omitted for Phase II]

*(Active customer contacts to avoid irrational behavior of customers at the transition from year 1999 to 2000; response to requests for information on Y2k readiness from others such as local phone company, hospitals etc.)*

### 3.6 Quality control to ensure that Y2k readiness is achieved and maintained

*(Role of inside auditors; outside auditors, NERC test participation, procedures in place to ensure that readiness state is not lost as a result of warranty changes, upgrades etc.)*

- Procedures for clean management are in place (change control) and have already intercepted at least one non-Y2k ready replacement part.
- As part of its contingency plan, the plant has a satellite telephone system it intends to use it if needed for the 12/31/99 rollover.
- The plant has not participated in the NERC drills.

### 3.7 Contingency plans for EMS/SCADA/Real-time

*(Horizon for plan, trial of plan procedures, special staffing and manual controls at the transition, self-generation and special provisions to deal with large load swings, dependency on public communication systems and preparedness for phone system – including cellular system –overloads etc.)*

- The plant has created a very detailed contingency plan. It focuses on the 12/31/99-01/01/00 transition but spans a few days into year 2000.
- In case of major power system disturbances, the plant will be used to serve the local community instead of the processing plant.
- The manager is a member of the city's various Y2k emergency preparedness committees.

## 4. Position of the Utility at Time of Assessment

### 4.1 General position on EMS/SCADA/Real-time

*(Progress on schedule towards Y2k readiness; budget spent versus projected, remaining work; criticality of this work; participation in April 9 NERC Exercise; opinions of auditors – if any etc.)*

- System went through integrated operation tests on Good Friday 1999, and passed.

### 4.2 Review of plans and relevant documentation

*(Existence of documents; errors and omissions in documents; vendor/supplier readiness information etc.)*

- No significant documentation defects seen in the review.

### 4.3 Review of test records

*(Existence of test procedures; test result documentation; completeness on testing to known problem dates, test procedures likely to catch the known problems; reliance on vendor information or actual testing of mission-critical systems, use of test data from sources such as EPRI, other utilities or other organizations with relevant data etc.)*

- Very detailed test procedures and well-documented test results
- Vendor performed final tests on-site but included the plant staff.

#### 4.4 Retest of selected equipment/systems

*(Selection process – assessors allowed to select or utility selection, repeat of test generated, same results as when utility (or tester) did the test last time etc.)*

- No equipment could be tested without a plant outage.

### 5. Interviews

#### 5.1 Interview #1 – *name and title of person interviewed*

*(Impressions from interview; concerns and or convictions and reasons for these)*

Title: Operations Manager  
Y2k Coordinator

- Both individuals are very confident the plant is Y2k ready
- Recognizing that without a gas supply the plant cannot operate, the utility is closely monitoring the situation.
- Plans to begin extra staffing at midnight GMT. This plant will be in contact with similar organizations in Australia to get an early indication of any problems.
- Security is a concern, but is not necessarily related to Y2k.

#### 5.3 Key Concerns of Utility Managers

*(Include anything that may be helpful in understanding the reasons for the concern)*

See interview comments above.

### 6. Key People Participating in the Assessment

#### 6.1 Utility people (Titles only)

Operations Manager  
Y2k Coordinator  
ECI Supervisor

### 7. EMS/SCADA/Real-time Comments

#### 7.1 Preparations

#### 7.2 Vendor Responses

- Vendor performed assessments and remediation and testing under contract form plant.

#### 7.3 Testing

- Fully operational test run on Good Friday 1999 with no problems related to the DCS system

#### 7.4 Sign-off/Certification

# Profile of Organization Visited      Site Number 13

## 1. Year 2000 Readiness

*Select Level 1, 2 or 3 from below (delete those that do not apply)*

Based on the information gathered from the on-site review, the assessor is to make an evaluation of the organization's EMS/SCADA/Real-time systems ability to meet readiness dates for all mission-critical functions. The assessor will assign an overall level of risk based on the following:

- ☒ Level 3:      Organization should meet a readiness date of 10/31/99 for EMS/SCADA/Real-time systems and will be Y2k ready by 12/31/99.

The assessors reached this conclusion based on the following insights:

- The SCADA system is Y2k ready at the time of this review.
- The Y2k project team reports directly to the General Manager of the utility.
- The credibility of the Y2k readiness is high since every mission-critical device, which could be tested, was tested.
- Participated in power supplier 8/28/99 backup communications drill successfully.
- While the Y2k testing was thorough, the paper trail is not formal and lacks sign-off protocols.
- The organization is proud of its Y2k program and has proactively communicated these efforts to its customers and the general public.

## 2. Profile of Utility

### 2.1 General statistical information

Utility Type:	Municipal
Annual Gross Revenue (Year):	\$47 million
Control Area	No
System peak Demand:	240 MW (winter peaking)
Demand Characteristics:	
Number of Customers	
Number of Residential Customers	26,547
Number of Commercial Customers	3,154
Number of Industrial Customers	544
Number of Other Customers	Street and Traffic lighting - 185
Number of Substations:	18

### 2.2 Local Y2k environment

*(Include relevant information about the utility such as what fuel base is used for generation, black start capability, types of loads served by the utility, critical loads, dependence on power from others, degree of integration with other utilities etc.)*

- The utility owns no generation facilities, but is under contract to purchase all of its power requirements from one supplier.
- The utility has two interties to its power supplier transmission system and has a normally open connection to a neighboring utility.
- The utility has identified its critical demands to be:  
Hospital

Regional Airport  
Local FAA facilities  
Local Broadcast station (TV & Radio)  
Nursing Homes  
Life support customers  
Fire station  
Police station

### 3. Year 2000 Readiness History

#### 3.1 Start of Y2k preparation

*(When did the preparation begin and at whose initiative. What was the budget and personnel allocated to achieve Y2k readiness, key people in Y2k project with reporting – organization chart if available to be attached)*

- The General Manager started the utility's Y2k program.
- The Y2k team started the program by checking the utility's computers for readiness. The team attended seminars conducted by the utility's power provider and became aware of the need to expand the program to check the embedded chips in devices on the distribution system.
- The utility had no specific budget for Y2k preparations, instead expenses came out of the general operating funds.

*(Role of outside consultants and auditors)*

- No outside consultants were used in the utility's preparations for the Year 2000

#### 3.2 Assessment strategy for EMS/SCADA/Real-time

*(Inventory process or the method used to identify inventory – walk through, BOM combinations etc. Identification of all possible components, all digital or only the critical digital systems. Definition of critical (i.e., business critical or mission critical - keep the lights on)*

- The utility did not use a formal process to inventory the components of the SCADA system. The utility does not have a complex SCADA system and the utility staff is very familiar with the master station hardware, SCADA software, and RTUs.

*(Assessment strategy/testing- relied on vendor information, sample testing, simple testing – reduced data set etc.)*

- The utility used a combination of vendor information, Y2k testing, and testing information from a neighboring utility to assess the Y2k readiness of its SCADA system.
- The utility performed integrated testing with a reduced data set to assess the SCADA system.

*(Critical supplier approach - Method used to identify critical suppliers; e.g. purchase records etc. (power suppliers, fuel suppliers, water suppliers, phone service, and other vendor strategy)*

- The utility used an informal process in determining its critical suppliers. Because the utility does not own any generation facilities, the critical suppliers were deemed to be the phone service provider, SCADA vendor, and parts supplier for the distribution system.

### 3.3 Test strategy and procedures for EMS/SCADA/Real-time

*(Risk based priority test strategy - highest business impact tests first and more comprehensive tests applied. Lower impact not tested at all or at a less detailed level or other strategies)*

- The Y2k team decided to perform the SCADA system date rollover test of the SCADA computers. This test would verify all of the components in the system without independent date functions, such as the RTUs.
- All testable devices identified in the inventory were tested individually and as integrated components if part of a system.

*(Testing procedures - Compliance assessment testing: test date and date transitions testing; Application tests; validation tests (of remediation work); Differentiation between large and complex systems and small, stand-alone systems with embedded chips; Integrated tests or unit tests; Test audits)*

The test procedures for the SCADA system involved allowing the system clock to rollover into the Year 2000 and testing the system for proper functionality.

Testing Steps:

- 1) Disconnect the leased line connections to all substations but the ones involved in the integrated testing.
- 2) Set the date/time on master station "B" to 12/31/1999 23:58:00
- 3) Allow the clock to rollover to 1/1/2000
- 4) Perform a control function at one of the connected substations
- 5) Check system log for proper reporting
- 6) Reset master station clock

Testing for the 2/28/00 – 2/29/00 transition was also performed as apart of this review

### 3.4 Remediation strategy for EMS/SCADA/Real-time

*(Fix or replace; in-house versus outsourcing; live with the problem and adjust settings manually; differentiation between large and complex systems and small stand-alone units)*

- All assessment and testing efforts revealed that no remediation was necessary for the utility's SCADA system.

### 3.5 Customer information and survey responses [Omitted for Phase II]

*(Active customer contacts to avoid irrational behavior of customers at the transition from year 1999 to 2000; response to requests for information on Y2k readiness from others such as local phone company, hospitals etc.)*

### 3.6 Quality control to ensure that Y2k readiness is achieved and maintained

*(Role of inside auditors; outside auditors, NERC test participation, procedures in place to ensure that readiness state is not lost as a result of warranty changes, upgrades etc.)*

- Y2k team must approve any new installations made on the power system.
- Purchase requests must be signed by the Director of Operations and Engineering



### 3.7 Contingency plans for EMS/SCADA/Real-time

*(Horizon for plan, trial of plan procedures, special staffing and manual controls at the transition, self-generation and special provisions to deal with large load swings, dependency on public communication systems and preparedness for phone system – including cellular system –overloads etc.)*

- The contingency plan includes a work around for all areas of the utility operations that utilize microprocessor technology.
- The contingency plan for system failure is to dispatch crews to the substations and coordinate operations using the mobile radio system. The plan is considered adequate because the utility has crews who perform maintenance on, and have access to the substations, and regularly use the mobile radio system.
- Contingency also provides staffing on key dates for manual operation.
- The utility will staff the transmission substation feeding their system to communicate with their power supplier by radio if needed.

## 4.0 Position of the Utility at Time of Assessment

### 4.1 General position on EMS/SCADA/Real-time

*(Progress on schedule towards Y2k readiness; budget spent versus projected, remaining work; criticality of this work; participation in April 9 NERC Exercise; opinions of auditors – if any etc.)*

- Utility has completed its Y2k readiness for SCADA/EMS and will continue to monitor for developments.
- The utility completed its readiness preparations in May 1999.

### 4.2 Review of plans and relevant documentation

*(Existence of documents; errors and omissions in documents; vendor/supplier readiness information etc.)*

Power Supplier Fact Sheet  
Utility Y2k readiness update  
SCADA & Field testing summary  
Business and operational contingency plan  
SCADA vendor Y2k readiness assessments and upgrade letter

### 4.3 Review of test records

*(Existence of test procedures; test result documentation; completeness on testing to known problem dates, test procedures likely to catch the known problems; reliance on vendor information or actual testing of mission-critical systems, use of test data from sources such as EPRI, other utilities or other organizations with relevant data etc.)*

- The utility did not use formally written test procedures to test the SCADA system.
- The system log report was used as the test result documentation to show that the system operates normally in the Year 2000.
- The utility also has a statement from the SCADA vendor saying that the vendor's own internal testing of the SCADA system has revealed no problems.

#### 4.4 Retest of selected equipment/systems

*(Selection process – assessors allowed to select or utility selection, repeat of test generated, same results as when utility (or tester) did the test last time etc.)*

- Assessors were able to select test for re-testing.  
Selection: integrated SCADA/EMS 12/31/99 – 1/1/00 Power on Rollover  
Selection: integrated SCADA/EMS 2/28/00 – 2/29/00 Power on Rollover
- The results of this testing were the same as indicated by the utility staff in their documentation.

### 5. Interviews

#### 5.1 Interview #1 – *name and title of person interviewed*

*(Impressions from interview; concerns and or convictions and reasons for these)*

Title(s):        Engineering Supervisor

- He is confident that the utility has made prudent preparations to be Year 2000 ready.
- He has been personally involved in making sure that all testable mission-critical devices were tested.
- The utility staff is somewhat concerned about public perception blaming Y2k for a “natural” outage.
- No concern for maintaining needed supply parts because the utility maintains a surplus stock in the winter as normal procedure.

#### 5.2 Interview #2 –

Title(s):        General Manager

- This individual is responsible for the entire operations of the utility.
- He is confident that the organization is thoroughly Y2k ready at this time.
- He participated in the Y2k contingency planning process and has reviewed and endorsed the plan.
- He was not willing to accept vendor Y2k readiness statements on mission-critical facilities and insisted that utility personnel test all such devices.

#### 5.3 Key Concerns of Utility Managers

*(Include anything that may be helpful in understanding the reasons for the concern)*

- The utility staff has expressed some concern over the public's misperception and panic about Y2k.

### 6. Key People Participating in the Assessment

#### 6.1 Utility people (Titles only)

General Manager

Director of Engineering and Operations

Supervisor of Engineering

## **7. EMS/SCADA/Real-time Comments**

### **7.1 Preparations**

- Communicated with Vendor -  
The utility contacted its SCADA vendor to obtain Y2k readiness information. This effort aided the utility in gaining knowledge about the readiness status of the individual components of the system.
- Contacted neighboring utility with same system -  
They contacted a neighboring utility with the same version SCADA system to gain more insight into the system's readiness status. The neighboring utility reported that they had tested their system and found no Y2k problems.
- Performed integrated testing -  
The utility itself preformed integrated testing. See sections 3.3 and 4.4 of this report.

### **7.2 Vendor Responses**

- In response to the utility's inquiry, the vendor sent a letter outlining the Y2k status of its SCADA products (hardware and software).
- The vendor offered testing services, but the utility opted to test the SCADA system itself.

### **7.3 Testing**

Integrated SCADA/EMS 12/31/99 – 1/1/00 Power on Rollover

Integrated SCADA/EMS 2/28/00 – 2/29/00 Power on Rollover

The test procedures for the SCADA system involved allowing the system clock to rollover into the Year 2000 and testing the system for proper functionality.

Testing Steps:

- 1) Disconnect the leased line connections to all substations but the ones involved in the integrated testing.
- 2) Set the date/time on master station "B" to 12/31/1999 23:58:00
- 3) Allow the clock to rollover to 1/1/2000
- 4) Perform a control function at one of the connected substations
- 5) Check system log for proper reporting
- 6) Reset master station clock

Testing for the 2/28/00 – 2/29/00 transition was also performed as apart of this review

### **7.4 Sign-off/Certification**

- The utility has not gone through formal sign-off or certification procedures, but has stated its testing results in its customer communications.

## Profile of Organization Visited      Site Number 14

### 1. Year 2000 Readiness

**Based on the information gathered from the on-site review, the assessor is to make an evaluation of the organization's EMS/SCADA/Real-time systems ability to meet readiness dates for all mission-critical functions. The assessor will assign an overall level of risk based on the following:**

- ☒ Level 3:      Organization should meet a readiness date of 10/31/99 for EMS/SCADA/Real-time systems and will be Y2k ready by 12/31/99.

The assessors reached this conclusion based on the following insights:

- Y2k efforts related to SCADA were characterized by an early start, a timely call to replace system, holding to schedule and specifications, own testing, and good staff expertise.
  - Utility accurately reported that their SCADA system was Y2k ready ahead of the NERC 6/30/00 deadline.
  - The on-site visit verified this SCADA readiness and the utility's continuing efforts in SCADA contingency planning.
  - During the visit Y2k tests were rerun on the SCADA master through to RTUs and on select relays. The reviewers witnessed the test methodology and results.
  - The utility's Y2k program is well situated in a community-wide effort of reporting and contingency planning. This arrangement also serves as an oversight review of utility readiness.
  - The utility has devoted ample attention, planning and resources to effectively address Y2k issues related to SCADA. Its early start allowed their vendors to respond completely and with warranty coverage. Its end-to-end testing further backed this up.
- See attachment for additional observations

### 2. Profile of Utility

#### 2.1 General statistical information

Utility Type:	Municipal
Annual Gross Revenue (Year):	\$54.6M (1998)
Control Area	No
System peak Demand:	210 MW
Demand Characteristics:	
Number of Customers	48,800
Number of Residential Customers	
Number of Commercial Customers	400+
Number of Industrial Customers	
Number of Other Customers	
Number of Substations:	6

## 2.2 Local Y2k environment

*(Include relevant information about the utility such as what fuel base is used for generation, black start capability, types of loads served by the utility, critical loads, dependence on power from others, degree of integration with other utilities etc.)*

- Utility's primary power supply is generated by a generating organization and is comprised of a combination of coal fired and hydroelectric generation.
- The utility has been informed by its power supplier that even if all fossil resources were to go off line, the capacity of hydroelectric reserves (with about a 4-hour startup) would most likely be enough to meet the requirements of the region (if the region demand is about 30% of peak, hydro can meet it).

## 3. Year 2000 Readiness History

### 3.1 Start of Y2k preparation

*(When did the preparation begin and at whose initiative. What was the budget and personnel allocated to achieve Y2k readiness, key people in Y2k project with reporting – organization chart if available to be attached)*

- The electric utility has been actively involved with a citywide plan. Overall the city has created and maintained a database of all date sensitive equipment owned and operated by any city entity.
- Early identification of Y2k issues (as they relate to SCADA in particular) focused the attention of key managerial and technical staff. Through this focus, the decision to replace the "legacy" based SCADA system was implemented.
- Y2k issues have been addressed at most implementation levels including the system specification, system factory acceptance testing (FAT), site acceptance testing (SAT) and re-run of tests (verified by the utility on site).

### 3.2 Assessment strategy for EMS/SCADA/Real-time

*(Inventory process or the method used to identify inventory – walk through, BOM combinations etc. Identification of all possible components, all digital or only the critical digital systems. Definition of critical (i.e., business critical or mission critical - keep the lights on)*

- A citywide procedure of identifying all date sensitive devices was followed and has been maintained. Because of this all-inclusive inventory, these systems (either business or mission critical) have either been repaired or replaced.

*(Assessment strategy/testing- relied on vendor information, sample testing, simple testing – reduced date set etc.)*

- A wide array of readiness related actions have been performed.
- Staff have collected vendor readiness statements in letter and Internet forms, defined Y2k and date related issues during the specification process for new equipment procurement, included a citywide statement of Y2k requirements with all purchases and have performed testing on critical systems before implementation.

*(Critical supplier approach - Method used to identify critical suppliers; e.g. purchase records etc. (power suppliers, fuel suppliers, water suppliers, phone service, and other vendor strategy)*

- The utility has worked closely with its power supplier on Y2k related issues. The utility has also been informed of its power supplier's status and actions.
- Planning actions have also been taken to ensure redundant communications are in place with the utilities power supplier.

### 3.3 Test strategy and procedures for EMS/SCADA/Real-time

*(Risk based priority test strategy - highest business impact tests first and more comprehensive tests applied. Lower impact not tested at all or at a less detailed level or other strategies)*

- Comprehensive tests have been performed on nearly all components of the utilities SCADA system.
- Tests have been run from the master station (hardware and software), remote processors and data converters (RTUs) and individual field components (i.e. meters and relays).

*(Testing procedures - Compliance assessment testing: test date and date transitions testing; Application tests; validation tests (of remediation work); Differentiation between large and complex systems and small, stand-alone systems with embedded chips; Integrated tests or unit tests; Test audits)*

The testing methodology has generally been performed on SCADA equipment in the following order:

1. Change system date(s) and time(s)
2. Verify operation post date/time change
3. Issue command and verify operation after date/time change
4. Revert date/time back to present
5. Verify operation and log results.

### 3.4 Remediation strategy for EMS/SCADA/Real-time

*(Fix or replace; in-house versus outsourcing; live with the problem and adjust settings manually; differentiation between large and complex systems and small stand-alone units)*

- Generally the utility has had very little reliance on outside entities for SCADA and related components.
- The utility has characterized components, evaluated state and potential impact and made changes/corrections as needed.
- Low importance on strategy has been required on SCADA and related equipment because of the recent implementation of a new SCADA system.

### 3.5 Customer information and survey responses [Omitted for Phase II]

*(Active customer contacts to avoid irrational behavior of customers at the transition from year 1999 to 2000; response to requests for information on Y2k readiness from others such as local phone company, hospitals etc.)*

### 3.6 Quality control to ensure that Y2k readiness is achieved and maintained

*(Role of inside auditors; outside auditors, NERC test participation, procedures in place to ensure that readiness state is not lost as a result of warranty changes, upgrades etc.)*

- As part of the city's overall plan, all new equipment purchases must comply with a "blanket" Y2k statement.
- The city has required city entities to report status of Y2k related activities on a bi-monthly basis to the city manager.
- It should also be noted that the utility did correctly issue a statement of Y2k Readiness to NERC before the 6-30-99 target date.

### 3.7 Contingency plans for EMS/SCADA/Real-time

*(Horizon for plan, trial of plan procedures, special staffing and manual controls at the transition, self-generation and special provisions to deal with large load swings, dependency on public communication systems and preparedness for phone system – including cellular system –overloads etc.)*

- Both the city and the utility have contingency plans in place.
- As part of the plan for the transition period, additional staff will be deployed at key system locations.
- The utility is properly prepared to provide its own power and communication with its power supplier should the need arise.
- Although the utility did participate in the September 9, 1999 drill, a few additional tests have been performed.

## 4. Position of the Utility at Time of Assessment

### 4.1 General position on EMS/SCADA/Real-time

*(Progress on schedule towards Y2k readiness; budget spent versus projected, remaining work; criticality of this work; participation in April 9 NERC Exercise; opinions of auditors – if any etc.)*

- Overall confidence of managerial and technical staff is very high.
- At the time of the audit, considerable planning and effort have resulted (auditors opinion) in a very low risk of loss of SCADA.
- Exercises have not been actively demonstrated, but appropriate planning and resource allocation will be deployed on 12-31-99.

### 4.1 Review of plans and relevant documentation

*(Existence of documents; errors and omissions in documents; vendor/supplier readiness information etc.)*

- Overall, the utility has maintained an appropriate amount of documentation in a "de-centralized" manner.
- Very little documentation relative to SCADA master station testing was apparent, but could be generated in a short amount of time.

## 4.2 Review of test records

*(Existence of test procedures; test result documentation; completeness on testing to known problem dates, test procedures likely to catch the known problems; reliance on vendor information or actual testing of mission-critical systems, use of test data from sources such as EPRI, other utilities or other organizations with relevant data etc.)*

- Examples of testing procedures were collected and reviewed during the audit. Due to the relatively recent deployment SCADA and related components, most (if not all) components addressed Y2k and associate date(s) in the system specification process.
- Vendor readiness statements have been collected by the utility and are part of the utilities system file.

## 4.3 Retest of selected equipment/systems

*(Selection process – assessors allowed to select or utility selection, repeat of test generated, same results as when utility (or tester) did the test last time etc.)*

- Utility staff performed a (utility designated) re-run of tests on the master station, remote terminal units (RTUs) and select remote intelligent electronic devices (IEDs).
- Re-run of these test demonstrated the system(s) ability to operate during and after date rollovers, and the ability of the system(s) to instantly return to current date/time with no disruptions to system operability.

## 5. Interviews

### 5.1 Interview #1 – *name and title of person interviewed*

*(Impressions from interview; concerns and or convictions and reasons for these)*

Title(s):     Substation Electrical/Communications Specialist  
                  Information Technology and Utility Manager  
                  Electric System Engineering Manager

- No concerns were voiced during the interview process.
- Overall, the staff involved with the audit is highly confident and prepared for Y2k related matters.

### 5.3 Key Concerns of Utility Managers

*(Include anything that may be helpful in understanding the reasons for the concern)*

## 6. Key People Participating in the Assessment

### 6.1 Utility people (Titles only)

Utility Information Technology Manager  
System Design and Information Technology Division Manager  
Network/Application Specialist



Substation Electrical/Communications Specialist  
Electric system Engineering Manager

## **7. EMS/SCADA/Real-time Comments**

### **7.1 Preparations**

- Early identification of the legacy based system lead to an early decision to replace the SCADA systems during the specification process, Y2k and date.

### **7.2 Vendor Responses**

- During system specification, language included date sensitive readiness requirements.
- Vendor statements of readiness have also been collected by the utility.

### **7.3 Testing**

- Testing of SCADA system and related components have been performed at all levels of system deployment. Testing has been performed during factory acceptance testing (FAT,) site acceptance testing (SAT) and on-site and re-run on an as needed basis.
- Results of this testing have been and will continue to be reported to the city manager on a bi-monthly basis.

### **7.4 Sign-off/Certification**

- General acceptance of readiness by managerial and technical staff.

### **Additional Observations**

- SCADA Y2k readiness work complete but under-documented for risk management and professional performance
- A SCADA Y2k preparations file along the lines suggested would serve the utility and staff well
- A chronology of Y2k events would serve as a good recap of well-directed efforts
- A city program review for risk management and completeness sign-off would be helpful
- The assessors suggested a rehearsal of contingency event including communication scenarios of loss of power, distribution system event and loss of SCADA, with and without full communications
- The assessors encouraged utility to continue adding to contingency plan along the ideas already in progress
  - Staffing plan overview
  - Alternative SCADA communications
  - City command center fit with electric operations
  - Information and timing expected with events during key dates

# Profile of Organization Visited      Site Number 15

## 1. Year 2000 Readiness

*Select Level 1, 2 or 3 from below (delete those that do not apply)*

**Based on the information gathered from the on-site review, the assessor is to make an evaluation of the organization's EMS/SCADA/Real-time systems ability to meet readiness dates for all mission-critical functions. The assessor will assign an overall level of risk based on the following:**

- ☒ Level 3:      Organization should meet a readiness date of 10/31/99 for EMS/SCADA/Real-time systems and will be Y2k ready by 12/31/99.

The assessors reached this conclusion based on the following insights:

- A clear strategy of major system replacement and upgrades prevailed for the Y2k program where EMS/SCADA was a significant part.
- Early identification of vulnerabilities led to a partnership with their EMS/SCADA vendor that allowed system remediation and replacement to take place as part of the new system acquisition process.
- The EMS/SCADA replacement contract cleverly made the vendor responsible for Y2k readiness regardless of the replacement schedule. The language and the relationship were strong enough to see this through, coupled with good project management.
- A strong centralized program structure along with NERC reporting led to early EMS/SCADA readiness backed up with vendor certification, own testing, and EMS/SCADA manager sign-off.
- Outside direction early in the program (1997) from a respected consultant and later (1999) a financial audit from a known CPA firm adds to the credibility of the program fit within it.
- Setting an early end of 1998 readiness target allowed able budgeting and project scheduling to facilitate all parts of the program including EMS/SCADA.

## 2. Profile of Utility

### 2.1 General statistical information

Utility Type:	Municipal
Annual Gross Revenue (Year):	\$777 Million
Control Area	Yes
System peak Demand:	2,428 MW
Demand Characteristics:	
Number of Customers	343,560
Number of Residential Customers	306,601
Number of Commercial Customers	34,246
Number of Industrial Customers	
Number of Other Customers	2,713
Number of Substations:	

## 2.2 Local Y2k environment

*(Include relevant information about the utility such as what fuel base is used for generation, black start capability, types of loads served by the utility, critical loads, dependence on power from others, degree of integration with other utilities etc.)*

- This organization generates most of its energy from coal-fired generation. Oil fired generation is utilized for peak demand conditions.
- The system is setup with total black-start capability and can be isolated from its integrated transmission system, if needed, to serve native load.
- The organization has enough generation to serve load and also sell excess energy to other parties.
- The Y2k readiness effort has included significant effort from many areas of the company.

## 3. Year 2000 Readiness History

### 3.1 Start of Y2k preparation

*(When did the preparation begin and at whose initiative. What was the budget and personnel allocated to achieve Y2k readiness, key people in Y2k project with reporting – organization chart if available to be attached)*

Preparation for Y2k began in 1996, as directed by the Vice President of Information Technologies. This position reports to the organization's CEO. The budget for the effort is expected to be about \$3 million dollars but does not include the cost of upgrades justified for other business purposes.

Planning for Y2k readiness and other upgrades was very thorough, which helped minimize last minute budgeting.

*(Role of outside consultants and auditors)*

- A reputable engineering and consulting firm was used to inventory and assess the business systems.
- A vulnerability analysis was performed on the inventoried items to help determine which items might have date related problems. The organization chose an outside consulting firm to perform these tasks in order to allow "fresh eyes" to see their system. They were not used for any of the testing because it was considered more reliable and cost-effective to use the resident expert and a member of the Y2k team.

### 3.2 Assessment strategy for EMS/SCADA/Real-time

*(Inventory process or the method used to identify inventory – walk through, BOM combinations etc. Identification of all possible components, all digital or only the critical digital systems. Definition of critical (i.e., business critical or mission critical - keep the lights on)*

- The consultant was used extensively for the inventory, assessment, and vulnerability analysis.
- Mission-critical items were identified as relating to the production and delivery of electricity.
- The mission-critical items, as determined by the vulnerability analysis, were given top priority for replacement and/or upgrading.
- Throughout the readiness process, the mission-critical inventory was informally compared to similar organizations.

*(Assessment strategy/testing- relied on vendor information, sample testing, simple testing – reduced data set etc.)*

- The organization requested vendor readiness statements and followed up with additional requests if needed.
- Vendor information was systematically gathered from the inventoried items, but was not taken at face value.
- Testing included items that were considered ready by the vendor.

*(Critical supplier approach - Method used to identify critical suppliers; e.g. purchase records etc. (power suppliers, fuel suppliers, water suppliers, phone service, and other vendor strategy)*

- Critical suppliers were identified in the process as those whose timely delivery was necessary for the supply of electricity.
- The organization had face-to-face meetings with the critical suppliers to make sure that they understood what tasks have been completed to achieve Y2k readiness and what contingency plans are in place.

### **3.3 Test strategy and procedures for EMS/SCADA/Real-time**

*(Risk based priority test strategy - highest business impact tests first and more comprehensive tests applied. Lower impact not tested at all or at a less detailed level or other strategies)*

- All the items from the vulnerability analysis were tested using a standardized certification process.
- One observation of the auditing team was that the EMS/SCADA testing relied on the utility staff's judgment regarding what tests should be performed and how to document the tests.

*(Testing procedures - Compliance assessment testing: test date and date transitions testing; Application tests; validation tests (of remediation work); Differentiation between large and complex systems and small, stand-alone systems with embedded chips; Integrated tests or unit tests; Test audits)*

- Microsoft Project was used to plan the certification process.
- The objectives of the process include validating the effectiveness of prescribed Y2k solutions, providing proof/evidence of due diligence, and creating a complete audit trail.
- The certification process created by the Y2k team was standardized and included a checklist to document each test.
- The checklist was useful in providing a standard method of evaluating the systems and to provide a means to follow up on future readiness issues such as date windowing.
- Each test utilized a resident expert and a member of the Y2k team. Both were required to sign off for Y2k readiness.
- Examples of the readiness test categories include internal date fields, year 2000 processing, and other date usage. Specific questions include determining if the system crosses critical dates successfully, if dates are used in sorting routines, date dependence of passwords and licenses, and date dependence of audit information.
- See the certification process attachment for more details.

### **3.4 Remediation strategy for EMS/SCADA/Real-time**

*(Fix or replace; in-house versus outsourcing; live with the problem and adjust settings manually; differentiation between large and complex systems and small stand-alone units)*

- The remediation strategy for the organization involved cost-effective upgrades and installation of new systems when needed. Most of the upgrades and changes involved reviewing the existing processes in order to increase efficiency.
- The readiness efforts highlight the organization's ability to react to challenges.
- A work-around solution has been implemented in coordination with one particular generation facility expected to be retired within the next five years. It was tested as not Y2k ready, but is able to produce energy, so remediation was not cost effective. This facility will continue to operate without any fixes or replacement until retirement.
- The remediation strategy for the SCADA system involved updating the software as needed to make sure all areas are Y2k Ready.

### **3.5 Customer information and survey responses [Omitted for Phase II]**

*(Active customer contacts to avoid irrational behavior of customers at the transition from year 1999 to 2000; response to requests for information on Y2k readiness from others such as local phone company, hospitals etc.)*

### **3.6 Quality control to ensure that Y2k readiness is achieved and maintained**

*(Role of inside auditors; outside auditors, NERC test participation, procedures in place to ensure that readiness state is not lost as a result of warranty changes, upgrades etc.)*

- The certification process gathered critical information about the systems that will ensure future readiness regardless of changes in date windowing, upgrades and other factors.
- A strong working relationship with the SCADA/EMS vendor has helped achieve readiness and reduce costs.
- A major accounting audit firm also provided a Y2k readiness statement, but it didn't include significant information about the SCADA/EMS system because it was not in their area of expertise.
- The organization participated in NERC's April and September readiness tests.

### **3.7 Contingency plans for EMS/SCADA/Real-time**

*(Horizon for plan, trial of plan procedures, special staffing and manual controls at the transition, self-generation and special provisions to deal with large load swings, dependency on public communication systems and preparedness for phone system – including cellular system –overloads etc.)*

- Nearly six months of 1999 were dedicated to developing contingency plans for the organization. This review process revealed that the SCADA/EMS operations staff did not know the details of the contingency plans. They explained it was because their main focus was to keep the system in operation.
- There are alternative forms of communication to the substations and plants, including cellular and satellite-based telephones, and a newly installed HAM radio system. These alternative communication forms require extra staff at each substation to be "human RTUs" by reporting substation readings and executing controls.
- The entire utility system is capable of being black-started and can also be isolated from the transmission system, if needed. The majority of the communication links are leased line, and the vendors have provided general assurance, but have not provided statements specific to their system.

- The contingency planning for the organization is also being coordinated with governmental agencies that are preparing for this event. Preparing and reacting to storm outages has been helpful to create and test contingency plans that will be useful for Y2k readiness.

## 4. Position of the Utility at Time of Assessment

### 4.1 General position on EMS/SCADA/Real-time

*(Progress on schedule towards Y2k readiness; budget spent versus projected, remaining work; criticality of this work; participation in April 9 NERC Exercise; opinions of auditors – if any etc.)*

- The organization originally planned to install a new Y2k Ready SCADA system and specified that it be Y2k Ready. The contract language was very effective because it allowed the vendor to either upgrade the existing system, or install a new Y2k Ready system. When the schedule slipped, they decided to upgrade the old system. The SCADA system was tested as Y2k Ready with all the final clean-ups in May of 1999. There is not any additional work needed for Y2k readiness.
- The organization participated in the April and the September NERC exercises. All system changes for the SCADA/EMS and other applications will be “frozen” from November 1, 1999, to February 2000, to make sure the systems are not inadvertently altered.

### 4.2 Review of plans and relevant documentation

*(Existence of documents; errors and omissions in documents; vendor/supplier readiness information etc.)*

- The certification process for the organization is formal and standardized, but this procedure was not closely followed for the SCADA/EMS testing.
- The method of documentation for SCADA tests was not as rigorous as the defined certification process. If the operations and SCADA staff takes some time to create a document describing the test process the resulting readiness will withstand an auditor's scrutiny.
- The organization is expecting a Y2k readiness statement from their SCADA vendor. This will strengthen the Y2k readiness documentation.
- The organization is also utilizing internal staff that has previous IRS auditing experience to improve Y2k documentation.

### 4.3 Review of test records

*(Existence of test procedures; test result documentation; completeness on testing to known problem dates, test procedures likely to catch the known problems; reliance on vendor information or actual testing of mission-critical systems, use of test data from sources such as EPRI, other utilities or other organizations with relevant data etc.)*

- The documentation of the test is limited and it is comprised of a checklist of the test descriptions and dates.
- The utility testing matrix included the areas to test such as tagging, logon, acknowledging alarms, analog input, and video trend, remote consoles, disturbance data collection, data links with other organizations, MVA calculations, and calculation points. All of these areas passed the final test, but there were some issues identified in the interchange and the utility areas that required additional changes.

#### 4.4 Retest of selected equipment/systems

*(Selection process – assessors allowed to select or utility selection, repeat of test generated, same results as when utility (or tester) did the test last time etc.)*

The 12/31/1999 rollover re-test of the system was performed on CPU-A with one RTU directed to the system.

1. The alarm listing and the minute-to-minute data report were printed out before the rollover.
2. A 100 MW transaction was put in the system in a manner that it was to be loaded for 12/31/1999.

The transaction was successfully loaded for the next day.

The following functions were successfully performed before and after the rollover date:

1. The one-line data screen was successful read,
2. Under-frequency relay was disabled and enabled,
3. Alarms were logged successfully.
4. Trip and close events and the tag function also worked after the rollover date.

All of these tests were considered adequate by both parties to identify the system as Y2k Ready.

### 5. Interviews

#### 5.1 Interview #1 – *name and title of person interviewed*

*(Impressions from interview; concerns and or convictions and reasons for these)*

Title(s): EMS/SCADA Manager

- This person was very involved in the testing and efforts to upgrade the SCADA system to be Y2k Ready.
- Others were more involved in the contingency planning, and there seemed to be a gap of understanding as to how the contingency plan fits in with the responsibilities of this manager.
- March 15, 1998 was cited as the original date when the SCADA system was to be ready.
- May 1999 was the final date when the existing system was considered Y2k Ready.
- Utility was determined to be Y2k ready by May 1999.

#### 5.3 Key Concerns of Utility Managers

*(Include anything that may be helpful in understanding the reasons for the concern)*

- The only concerns of the utility managers were acts of vandalism and outages being blamed on Y2k.

### 6. Key People Participating in the Assessment

#### 6.1 Utility people (Titles only)

Vice President, System Operations

Chief Information Officer – Technology

Manager, Control Systems

Engineer, System Dispatch Division  
Director, Database Administrator/Engineering Systems

## **7. EMS/SCADA/Real-time Comments**

### **7.1 Preparations**

- The SCADA system readiness effort was pursued in a timely and cost-effective manner.
- The organization's strong relationship with the SCADA vendor has helped significantly with the readiness effort.
- The existing system is twelve years old and although the organization is in the process of acquiring a new system, it is a priority to have a Y2k Ready system. The contract language for the new SCADA system assured that the organization would have a Y2k Ready system, even if the old system had to be upgraded.

### **7.2 Vendor Responses**

- The organization had a very strong working relationship with SCADA/EMS Vendor, and this has helped considerably in getting a good response from the vendor. Normally an expensive service contract is needed to maintain a good working relationship with a SCADA vendor, but this organization has not needed a contract to have a strong relationship.
- SCADA/EMS Vendor was awarded the contract for the new SCADA system, but the organization is confident that even if the SCADA/EMS Vendor was not awarded the contract, that they would have provided good service in making the existing system Y2k Ready. May be unnecessary to name vendor here in this context.

### **7.3 Testing**

- In January 1998, the contract for a new SCADA system was completed. The original terms of the contract called for installation of the new system. When it was apparent that this deadline was not going to be met, upgrading of the existing system was pursued. The organization has been very successful in maintaining a strong working relationship with SCADA/EMS vendor, even without having a service contract.
- Upgrading the existing system started with an assessment at the factory to determine which systems needed to be upgraded. These changes were then loaded on the on-site alternate computer system for testing. This testing revealed the need for more changes to the system.
- After these changes were complete, there was enough confidence in the new system to test it online for less than an hour. This test identified additional changes, but these were not considered mission critical. The base system was re-tested at the factory and then the new version was tested on the organization's alternate system. After additional testing on the alternate system, the software was placed on the main system and monitored without failure for five hours.
- All support staff and the SCADA/EMS Vendor's technical staff were present for this test and were instructed to look the system over very carefully for any abnormalities. The details of the testing procedure and results were not available.
- SCADA/EMS Vendor was very involved in Y2k testing the SCADA system. This testing involved working with the organization to upgrade the SCADA system until the parties were comfortable doing a full-scale date-rollover test. The SCADA vendor was present for this five-hour test that was designed to test the functions and reporting.
- The five-hour 01/01/2000 rollover re-test of the system was performed on CPU-A with one RTU directed to the system. The alarm listing and the minute-to-minute data report were printed out before the rollover. A 100 MW transaction was put in the system in a manner that



it was to be loaded for 01/01/2000. The transaction was successfully loaded for the next day. The following functions were successfully performed before and after the rollover date; The one-line data screen was successful read. Under-frequency relay was disabled and enabled. Alarms were logged successfully.

- Trip and close events and the tag function also worked after the rollover date. All of these tests were considered adequate by both parties to determine that the system is Y2k Ready.
- SCADA/EMS Vendor loaded the organization's version of the code on their factory site system in order to update the code with any changes. The software was considered to be Y2k Ready and loaded by May 1999.

#### **7.4 Sign-off/Certification**

- The organization will be pursuing a final sign-off from SCADA/EMS Vendor now that the system is Y2k Ready. This is not expected to be a problem because of the strong relationship with the vendor and both parties were satisfied with the testing.

## Profile of Organization Visited      Site Number 16

### 1. Year 2000 Readiness

Based on the information gathered from the on-site review, the assessor is to make an evaluation of the organization's EMS/SCADA/Real-time systems ability to meet readiness dates for all mission-critical functions. The assessor will assign an overall level of risk based on the following:

- ☒ Level 3:      Organization should meet a readiness date of 10/31/99 for EMS/SCADA/Real-time systems and will be Y2k ready by 12/31/99.

The assessors reached this conclusion based on the following insights:

- Early awareness of Y2k issues (July of 1997 for SCADA)
- Early identification of SCADA/EMS as critical systems
- Early and complete communication system(s) assessment
- Good redundancy for voice communication (land, cell, satellite)
- Thorough assessment of SCADA/EMS communication – past verification of system operations (communication) loss from hurricanes in past years
- Required vendor (EMS/SCADA) verification of implemented system during factory acceptance testing (FAT) and Y2k roll-over test(s)
- Obtained vendor documentation of readiness on system (SCADA/EMS) and related equipment that could pose Y2k (type) risk (s)
- Expected cut-over date to new SCADA/EMS (Y2k tested) expected in next 30 business days (early to mid October)
- Assessed and verified system(s) LAN and WAN

### 2. Profile of Utility

#### 2.1 General statistical information

Utility Type:	<u>Joint Action Agency – Municipal Agency</u>
Annual Gross Revenue (Year):	<u>56 million</u>
Control Area	<u>Yes</u>
System peak Demand:	<u>240 MW in Control area, 180 MW Responsible</u>
Demand Characteristics:	<u>(Only wholesale) 9 all requirements members</u>
Number of Customers	<u>3 project oriented</u>
Number of Residential Customers	<u>None</u>
Number of Commercial Customers	<u>None</u>
Number of Industrial Customers	<u>None</u>
Number of Other Customers	<u>None</u>
Number of Substations:	<u>0</u>

#### 2.2 Local Y2k environment

*(Include relevant information about the utility such as what fuel base is used for generation, black start capability, types of loads served by the utility, critical loads, dependence on power from others, degree of integration with other utilities etc.)*

- All diesels in utility are black start with enough capacity to start the adjacent steam units. Steam units, though primarily coal-fired, may be fueled with natural gas.
- The utility is dependent on outside providers for transmission infrastructure as they are generation and control only.
- Overall, the utility has been in contact and maintained communications with the outside entities that relied on for the transport of generation.

### 3. Year 2000 Readiness History

#### 3.1 Start of Y2k preparation

*(When did the preparation begin and at whose initiative. What was the budget and personnel allocated to achieve Y2k readiness, key people in Y2k project with reporting – organization chart if available to be attached)*

- Started in July 1997, when they solicited for consultants to replace the EMS
- Each department was responsible to report their own problems
- There was not a breakout of the Y2k budget – any changes were part of the budget of the previous year.
- They assumed that the old EMS system was not Y2k Ready. The utility did not test to confirm that the system was not ready.

*(Role of outside consultants and auditors)*

- The utility hired a consultant to design, specify and monitor the delivery of the new EMS system
- Y2k was not the only reason to update the SCADA/AGC system – computer time issue was present –40 minutes to crunch an hour's data, and the database could not be expanded
- Internal review with management staff to validate the problems

#### 3.2 Assessment strategy for EMS/SCADA/Real-time

*(Inventory process or the method used to identify inventory – walk through, BOM combinations etc. Identification of all possible components, all digital or only the critical digital systems. Definition of critical (i.e., business critical or mission critical - keep the lights on)*

- Early in the scope of Y2k related issues, the utility assumed the old SCADA/AGC system was not ready. As a result, the utility decided that they would replace the existing system with date-sensitive compatible equipment.
- Generation plant controls did not have digital equipment (pneumatically controlled); equipment pre-dates microprocessor based operation, therefore is Y2k Ready.

*(Assessment strategy/testing- relied on vendor information, sample testing, simple testing – reduced data set etc.)*

- Obtained vendor information and tested major Y2k dates for readiness.

*(Critical supplier approach - Method used to identify critical suppliers; e.g. purchase records etc. (power suppliers, fuel suppliers, water suppliers, phone service, and other vendor strategy)*

- Critical suppliers were determined by whether they supported a mission-critical function of the utility. Where appropriate, the utility has made arrangements to the extent possible for excess supplies (i.e. coal reserves on hand).

### 3.3 Test strategy and procedures for EMS/SCADA/Real-time

*(Risk based priority test strategy - highest business impact tests first and more comprehensive tests applied. Lower impact not tested at all or at a less detailed level or other strategies)*

- Y2k testing was performed as part of the FAT and site acceptance testing (SAT) of the new EMS. The test procedures for the FAT and SAT were reviewed as part of this audit.

*(Testing procedures - Compliance assessment testing: test date and date transitions testing; Application tests; validation tests (of remediation work); Differentiation between large and complex systems and small, stand-alone systems with embedded chips; Integrated tests or unit tests; Test audits)*

The following functions were tested for 12/31/99-1/1/00, 2/28/00-2/29/00, and 2/29/00-3/1/00 transitions:

Alarms  
Logging  
Report generation  
Supervisory controls  
Status point tag info  
Analog point tag info  
Accumulator tag info  
Status point hold  
Status point control disable  
Status point clearance  
Display notes  
Trending

### 3.4 Remediation strategy for EMS/SCADA/Real-time

*(Fix or replace; in-house versus outsourcing; live with the problem and adjust settings manually; differentiation between large and complex systems and small stand-alone units)*

- The utility used the strategy of a complete (forklift) replacement of the old, not Y2k Ready EMS. No work-around or patching was used as a remediation strategy.
- The utility chose a new Y2k-Ready EMS to ensure readiness.

### 3.5 Customer information and survey responses [Omitted for Phase II]

*(Active customer contacts to avoid irrational behavior of customers at the transition from year 1999 to 2000; response to requests for information on Y2k readiness from others such as local phone company, hospitals etc.)*

### 3.6 Quality control to ensure that Y2k readiness is achieved and maintained

*(Role of inside auditors; outside auditors, NERC test participation, procedures in place to ensure that readiness state is not lost as a result of warranty changes, upgrades etc.)*

- Expecting to be on new EMS in early October
- No other additions
- September 1999, the old system crashed and the new system worked
- Retest of new EMS system was performed in 9/99
- Surveys (NERC)
- 4/9/99 and 9/9/99 testing of the new EMS system

- EMS system redundancy has been tested between the old and the new system
- Factory acceptance test has been completed
- Site acceptance test has not been completed
- New EMS has been in the listening mode since March 1999

### **3.7 Contingency plans for EMS/SCADA/Real-time**

*(Horizon for plan, trial of plan procedures, special staffing and manual controls at the transition, self-generation and special provisions to deal with large load swings, dependency on public communication systems and preparedness for phone system – including cellular system –overloads etc.)*

- The utility has back-up generation for control center building
- EMS operators have been trained to operate manual mode of control in case of system failure
- Conventional land-based telephone will be expected as primary communication, however satellite and cellular phones will be used for back-up communication
- (Primary) RTU leased line communication is currently backed up with conventional two-wire land-based telephone communication

## **4. Position of the Utility at Time of Assessment**

### **4.1 General position on EMS/SCADA/Real-time**

*(Progress on schedule towards Y2k readiness; budget spent versus projected, remaining work; criticality of this work; participation in April 9 NERC Exercise; opinions of auditors – if any etc.)*

- The Y2k program is on schedule, with the organization ready at the time of the DOE review.

### **4.2 Review of plans and relevant documentation**

*(Existence of documents; errors and omissions in documents; vendor/supplier readiness information etc.)*

- Vendor EMS readiness statement
- Contingency plan
- FAT & SAT EMS test procedures and results

### **4.3 Review of test records**

*(Existence of test procedures; test result documentation; completeness on testing to known problem dates, test procedures likely to catch the known problems; reliance on vendor information or actual testing of mission-critical systems, use of test data from sources such as EPRI, other utilities or other organizations with relevant data etc.)*

- Test procedures from the vendor were used. Also reviewed “lab notes” from testing.

## 4.4 Retest of selected equipment/systems

*(Selection process – assessors allowed to select or utility selection, repeat of test generated, same results as when utility (or tester) did the test last time etc.)*

- No re-testing of the EMS was performed as part of this review

## 5. Interviews

### 5.1 Interview #1 – *name and title of person interviewed*

*(Impressions from interview; concerns and or convictions and reasons for these)*

Title(s): Assistant General Manager (AGM)

- Overall, the Assistant General Manager had little concern over utility operability during the up-coming transition periods.
- The AGM cited numerous reasons for this belief including the past ability of the utility to operate effectively during extreme weather periods (i.e. sending technicians off-site to communicate system information in person or from other telephone areas).
- Utility is in good position because of its rather stable demand and the ability of the operators to operate from experience with marginal system data.

### 5.2 Interview #2 –

Title(s): Energy Center Manager (ECM)

- The ECM has little or no concern over transitions period for the same reasons stated above.

### 5.3 Key Concerns of Utility Managers

*(Include anything that may be helpful in understanding the reasons for the concern)*

- The utility managers have little or no concerns with regards to Y2k. They feel that the Y2k transition will be a non-event, and the overall confidence.
- System knowledge gained in past extreme weather conditions have prepared them for any unanticipated system shortcomings.

## 6. Key People Participating in the Assessment

### 6.1 Utility people (Titles only)

Assistant General Manager  
Energy Center Manager

## **7. EMS/SCADA/Real-time Comments**

### **7.1 Preparations**

- Date related transition periods have been included in system specifications for the new system.
- Internal factors (local environment, power supply and redundant communication paths) have been implemented and verified.

### **7.2 Vendor Responses**

- The vendor responded to the specification of Y2k readiness on the new EMS by testing any site-specific customization to the base line system. After this testing was performed, the vendor issued a readiness statement for the utility's system.

### **7.3 Testing**

- Testing on date related transition periods have been included in the specification, FAT, SAT and verified and re-run on-site.

### **7.4 Sign-off/Certification**

- The vendor certified the system after Factory Acceptance Testing was completed.

# Profile of Organization Visited      Site Number 17

## 1. Year 2000 Readiness

*Select Level 1, 2 or 3 from below (delete those that do not apply)*

**Based on the information gathered from the on-site review, the assessor is to make an evaluation of the organization's EMS/SCADA/Real-time systems ability to meet readiness dates for all mission-critical functions. The assessor will assign an overall level of risk based on the following:**

- ☒ Level 3:      Organization should meet a readiness date of 10/31/99 for EMS/SCADA/Real-time systems and will be Y2k ready by 12/31/99.

The assessors reached this conclusion based on the following insights:

- The utility has performed an inventory and assessment to a level that demonstrates due diligence.
- The organization has developed a work-around for its legacy system, which will ensure the existence of a properly functioning EMS into the Year 2000. Coupled with the implementation of a new EMS/SCADA system (operational late 1999) mission-critical functions should be operational and available.
- The utility has properly defined mission vs. business critical functions.
- The utility has contacted and worked with its mission-critical suppliers in preparation for the Year 2000.

## 2. Profile of Utility

### 2.1 General statistical information

Utility Type:	Joint Action Agency
Annual Gross Revenue (Year):	
Control Area	Yes
System peak Demand:	675 MW
Demand Characteristics:	
Number of Customers	8 wholesale
Number of Residential Customers	N/A
Number of Commercial Customers	N/A
Number of Industrial Customers	N/A
Number of Other Customers	N/A
Number of Substations:	% ownership, nothing direct

### 2.2 Local Y2k environment

*(Include relevant information about the utility such as what fuel base is used for generation, black start capability, types of loads served by the utility, critical loads, dependence on power from others, degree of integration with other utilities etc.)*

- All system interties are with the utility's transmission provider
- The utility has enough capacity to meet its system demand and has no contract to purchase power.



- As a Joint Action Agency, the utility has limited participation in the generation and delivery of electricity to its member/customers. The utility owns, on a percentage basis, generation facilities (both coal fired and nuclear) but does not have staff or operational influence on the generation sites. Because of these items, the utility is wholly dependant on the performance of others.

### 3. Year 2000 Readiness History

#### 3.1 Start of Y2k preparation

*(When did the preparation begin and at whose initiative. What was the budget and personnel allocated to achieve Y2k readiness, key people in Y2k project with reporting – organization chart if available to be attached)*

- The utility's engineering manager initiated the Y2k program after becoming aware of the potential problem through discussions in the utility and computer press.
- No budget was specifically set aside for the Y2k program. All funds came out of the general ledger.
- Much of the focus on Y2k activities was contingent upon the utility's generation and transmission suppliers and a constant dialog has been maintained throughout Y2k preparations.

*(Role of outside consultants and auditors)*

Consultants were hired to perform the inventory and assessment of the EMS. The consultants also wrote the Y2k test procedures for the EMS/SCADA.

#### 3.2 Assessment strategy for EMS/SCADA/Real-time

*(Inventory process or the method used to identify inventory – walk through, BOM combinations etc. Identification of all possible components, all digital or only the critical digital systems. Definition of critical (i.e., business critical or mission critical - keep the lights on)*

- The utility personnel and consultants used the walk-through method to perform the inventory of electronic equipment.
- The inventory identified all electronic devices and software.

Readiness status categories:

Cs – Compliance stated, Y2k compliance stated by vendor, not tested

Ct – Tested by vendor and found to be compliant

NCs – Y2k non-compliance stated by vendor, not tested

NCt – Tested by vendor and found to be non-compliant

I – Inert, the asset has no firmware or date function

R – Y2k Ready

S – Suspect, compliance status is unknown, not supported by vendor, or will be tested by vendor

T – Under test, currently under test by vendor

*(Assessment strategy/testing- relied on vendor information, sample testing, simple testing – reduced date set etc.)*

- The assessment strategy included a combination of vendor information and testing on in-house equipment.
- The utility relied on generation and transmission suppliers' internal Y2k activities and has worked in conjunction with them.

*(Critical supplier approach - Method used to identify critical suppliers; e.g. purchase records etc. (power suppliers, fuel suppliers, water suppliers, phone service, and other vendor strategy))*

- Critical suppliers were determined by whether they supported a mission-critical function of the utility.
- Where appropriate, the utility has made arrangements for excess supply from critical suppliers.

### **3.3 Test strategy and procedures for EMS/SCADA/Real-time**

*(Risk based priority test strategy - highest business impact tests first and more comprehensive tests applied. Lower impact not tested at all or at a less detailed level or other strategies)*

- The EMS test procedures tested for all major Y2k dates.
- The test procedures were comprehensive in testing for proper functionality.

*(Testing procedures - Compliance assessment testing: test date and date transitions testing; Application tests; validation tests (of remediation work); Differentiation between large and complex systems and small, stand-alone systems with embedded chips; Integrated tests or unit tests; Test audits)*

- The utility tested its legacy system for the work-around of setting the system date to 1971. These tests checked for proper functionality and what adjustment personnel need to make about the 28-year difference

### **3.4 Remediation strategy for EMS/SCADA/Real-time**

*(Fix or replace; in-house versus outsourcing; live with the problem and adjust settings manually; differentiation between large and complex systems and small stand-alone units)*

- No remediation was performed on the legacy system because a new system is being installed.
- If testing of the new EMS/SCADA system reveals any problems, the components will be replaced under warranty.

### **3.5 Customer information and survey responses [Omitted for Phase II]**

*(Active customer contacts to avoid irrational behavior of customers at the transition from year 1999 to 2000; response to requests for information on Y2k readiness from others such as local phone company, hospitals etc.)*

### **3.6 Quality control to ensure that Y2k readiness is achieved and maintained**

*(Role of inside auditors; outside auditors, NERC test participation, procedures in place to ensure that readiness state is not lost as a result of warranty changes, upgrades etc.)*

- One of the utility's Y2k team members performs readiness checks on software and hardware purchases on an on-going basis.

### 3.7 Contingency plans for EMS/SCADA/Real-time

*(Horizon for plan, trial of plan procedures, special staffing and manual controls at the transition, self-generation and special provisions to deal with large load swings, dependency on public communication systems and preparedness for phone system – including cellular system –overloads etc.)*

Issues addressed in contingency plan:

- Staffing levels
- Critical communications paths
- Emergency alternative power supply
- Operating scenarios
- Loss of EMS
- Loss of metering
- Loss of plant communications
- Sabotage
- Public communications/notification

## 4. Position of the Utility at Time of Assessment

### 4.1 General position on EMS/SCADA/Real-time

*(Progress on schedule towards Y2k readiness; budget spent versus projected, remaining work; criticality of this work; participation in April 9 NERC Exercise; opinions of auditors – if any etc.)*

- The utility's SCADA/EMS system (new) is currently being deployed.
- Date sensitive issues were addressed in the system specification; however, they have not yet been tested.
- Transition periods will be tested during site acceptance testing (SAT) and remedied, if necessary

### 4.2 Review of plans and relevant documentation

*(Existence of documents; errors and omissions in documents; vendor/supplier readiness information etc.)*

- Inventory/Assessment Binders
- Contingency plan
- EMS test procedures

### 4.3 Review of test records

*(Existence of test procedures; test result documentation; completeness on testing to known problem dates, test procedures likely to catch the known problems; reliance on vendor information or actual testing of mission-critical systems, use of test data from sources such as EPRI, other utilities or other organizations with relevant data etc.)*

- The test procedures for the work-around of the legacy EMS were well documented. The test procedures also provided for sign-off by the staff performing the test.
- Test procedures have been developed for the new system and were reviewed during the audit.

#### **4.4 Retest of selected equipment/systems**

*(Selection process – assessors allowed to select or utility selection, repeat of test generated, same results as when utility (or tester) did the test last time etc.)*

- Did not perform any retesting as part of this review

### **5. Interviews**

#### **5.1 Interview #1 – *name and title of person interviewed***

*(Impressions from interview; concerns and or convictions and reasons for these)*

Title(s):       Manager of Engineering

#### **5.2 Interview #2 –**

Title(s):       Manager of Electric System Operations

#### **5.3 Key Concerns of Utility Managers**

*(Include anything that may be helpful in understanding the reasons for the concern)*

- None noted

### **6. Key People Participating in the Assessment**

#### **6.1 Utility people (Titles only)**

Manager of Engineering  
Systems Coordinator  
Manager of Electric System Operations  
System Control and Restoration Coordinator

### **7. EMS/SCADA/Real-time Comments**

#### **7.1 Preparations**

- Identified business/mission criticality
- Conducted inventory, developed remediation and or replacement criteria
- Worked closely with mission-critical suppliers

## **7.2 Vendor Responses**

### **7.3 Testing**

- Testing of functionality before-during-after date transition has been conducted on equipment.
- New SCADA/EMS has not yet been deployed but will be fully tested before hand-off occurs.
- Legacy system can be in place (platform of 1971) as tested and documented.

### **7.4 Sign-off/Certification**

- As testing has been performed, all verifications have been signed by person (s) performing tests. This approach created in-house accountability for testing.
- New SCADA/EMS will be tested with vendor presence before hand-off.
- Other vendors (where applicable) have been requested to provide readiness statements.

# Profile of Organization Visited      Site Number 18

## 1. Year 2000 Readiness

*Select Level 1, 2 or 3 from below (delete those that do not apply)*

Based on the information gathered from the on-site review, the assessor is to make an evaluation of the organization's EMS/SCADA/Real-time systems ability to meet readiness dates for all mission-critical functions. The assessor will assign an overall level of risk based on the following:

- ☒ Level 3:      Organization should meet a readiness date of 10/31/99 for EMS/SCADA/Real-time systems and will be Y2k ready by 12/31/99.

The assessors reached this conclusion based on the following insights:

- SCADA/EMS system Y2k ready at time of review
- Early identification and acceptance of potential Y2k issues
- Highly motivated and competent Y2k team
- Well-maintained database and supporting documentation
- Thorough test procedures and test result documentation; easy test replication and result comparison
- Multiple plan reviews: internal, external (Accounting/Insurance)
- Participation in NERC drills (4/9/99, 9/9/99)
- Well-structured contingency plan

## 2. Profile of Utility

### 2.1 General statistical information

Utility Type:	Public power
Annual Gross Revenue (Year):	\$775,639,000 (1998)
Control Area	Yes
System peak Demand:	3,729 MW
Demand Characteristics:	
Number of Customers	119,508
Number of Residential Customers	119,470 (includes small commercial)
Number of Commercial Customers	
Number of Industrial Customers	33 (includes military)
Number of Other Customers	
Number of Substations:	Transmission 74, Delivery 294, Interconnection 15

### 2.2 Local Y2k environment

*(Include relevant information about the utility such as what fuel base is used for generation, black start capability, types of loads served by the utility, critical loads, dependence on power from others, degree of integration with other utilities etc.)*

- In list of Top Ten largest state and local publicly owned electric system
- Sales: 35% military and large industrial; 46% cooperative, 8% commercial/small industrial.
- Generation – 10.2% purchased, 7.1% oil and gas, 8.1% nuclear, 3.3% hydro, 71.3% coal.

### 3. Year 2000 Readiness History

#### 3.1 Start of Y2k preparation

*(When did the preparation begin and at whose initiative. What was the budget and personnel allocated to achieve Y2k readiness, key people in Y2k project with reporting – organization chart if available to be attached)*

- Y2k work officially began in 1995.
- SCADA/EMS system specification from 1992 included a Y2k Ready clause. All purchase orders stipulate Y2k readiness.
- Y2k project office was established in 1998, and included a team of one manager and four engineers. Responsibility for Y2k issues rests at the departmental level but is overseen and coordinated by the Y2k team.
- An organizational chart is attached.

*(Role of outside consultants and auditors)*

3 types of audits have been conducted (excluding this one) by the utility.

- 1- Internal audit – audit of system and process to meet Y2k readiness.
- 2- External audit – audit of business systems and overall methodology by accounting firm.
- 3- Insurance audit – audit of methodology by insurance company.

A request has been made for a follow-up internal audit to be conducted in November 1999.

#### 3.2 Assessment strategy for EMS/SCADA/Real-time

*(Inventory process or the method used to identify inventory – walk through, BOM combinations etc. Identification of all possible components, all digital or only the critical digital systems. Definition of critical (i.e., business critical or mission critical - keep the lights on)*

- Primary method for inventory was system knowledge at device level by department. Y2k team subsequently reviewed items that were assigned a criticality rating at department level.
- 3 possible criticality levels:  
Mission critical – Failure could result in immediate disruption of service to customers or create safety issues.  
Priority 1 – Failure of service could lead to disruption of service to customers, impede business operations, or create safety issues if not restored in a timely manner.  
Priority 2 – Failure would create inconvenience

*(Assessment strategy/testing- relied on vendor information, sample testing, simple testing – reduced data set etc.)*

- 185 items identified as mission critical at department level. (All tests included rollover – year and leap year).
- 534 items identified as Priority 1. All testable devices were checked using specified testing procedures (all test procedures included rollover – year and leap year). All devices were remediated if necessary; test procedures and documentation are available. Contingency for mission critical is available at the device level and contained in the overall contingency plan.

*(Critical supplier approach - Method used to identify critical suppliers; e.g. purchase records etc. (power suppliers, fuel suppliers, water suppliers, phone service, and other vendor strategy)*

- The business office identified critical suppliers as: capacity/energy suppliers, coal suppliers, coal transporters, #2 fuel oil suppliers and banking services.
- The utility met with the suppliers, discussed their Y2k concerns and verified the status of these critical supplies.

### **3.3 Test strategy and procedures for EMS/SCADA/Real-time**

*(Risk based priority test strategy - highest business impact tests first and more comprehensive tests applied. Lower impact not tested at all or at a less detailed level or other strategies)*

- All testable devices and systems identified were tested individually and as integrated components if part of a system.

*(Testing procedures - Compliance assessment testing: test date and date transitions testing; Application tests; validation tests (of remediation work); Differentiation between large and complex systems and small, stand-alone systems with embedded chips; Integrated tests or unit tests; Test audits)*

- Testing procedures adopted at the utility are a subset of the GM Y2k test procedures adapted to suit the utility.
- The systems were tested as stand-alone systems and as part of an integrated system where applicable.

### **3.4 Remediation strategy for EMS/SCADA/Real-time**

*(Fix or replace; in-house versus outsourcing; live with the problem and adjust settings manually; differentiation between large and complex systems and small stand-alone units)*

- Work-arounds are identified for cosmetic issues.
- Upgrading and replacing was used for majority of issues identified.

### **3.5 Customer information and survey responses [Omitted for Phase II]**

*(Active customer contacts to avoid irrational behavior of customers at the transition from year 1999 to 2000; response to requests for information on Y2k readiness from others such as local phone company, hospitals etc.)*

### **3.6 Quality control to ensure that Y2k readiness is achieved and maintained**

*(Role of inside auditors; outside auditors, NERC test participation, procedures in place to ensure that readiness state is not lost as a result of warranty changes, upgrades etc.)*

- Audit procedures as identified in 3.1
- Purchase order clause as identified in 3.1
- Testing of new system devices.
- Note: SCADA system has upgrade available that deals with cosmetic issues. Utility declined upgrade based on cost and associated costs relating to retesting.



### 3.7 Contingency plans for EMS/SCADA/Real-time

*(Horizon for plan, trial of plan procedures, special staffing and manual controls at the transition, self-generation and special provisions to deal with large load swings, dependency on public communication systems and preparedness for phone system – including cellular system –overloads etc.)*

- Plan considers all aspects of SCADA/EMS as stand-alone or integrated system.
- Contingency was tested in association with NERC drills 4/9/99 and 9/9/99.
- Contingency plan includes extra staffing on key dates for manual operation and alternative communication for loss of multiple communication modes.

## 4. Position of the Utility at Time of Assessment

### 4.1 General position on EMS/SCADA/Real-time

*(Progress on schedule towards Y2k readiness; budget spent versus projected, remaining work; criticality of this work; participation in April 9 NERC Exercise; opinions of auditors – if any etc.)*

- Utility has completed its Y2k readiness for SCADA/EMS and will continue to monitor for developments.

### 4.2 Review of plans and relevant documentation

*(Existence of documents; errors and omissions in documents; vendor/supplier readiness information etc.)*

- All requested documentation was available and complete.

### 4.3 Review of test records

*(Existence of test procedures; test result documentation; completeness on testing to known problem dates, test procedures likely to catch the known problems; reliance on vendor information or actual testing of mission-critical systems, use of test data from sources such as EPRI, other utilities or other organizations with relevant data etc.)*

- The inventory had codes for each item that referenced files containing test procedures, test results, and contingency plans for all devices.
- Reliance was not based on vendor communication; the utility used testing to assess devices/system.

### 4.4 Retest of selected equipment/systems

*(Selection process – assessors allowed to select or utility selection, repeat of test generated, same results as when utility (or tester) did the test last time etc.)*

Assessors were able to select test for retesting.

Selection: integrated SCADA/EMS 12/31 – 1/1 Power on

Selection: integrated SCADA/EMS 2/28 – 2/29 Power off

## 5. Interviews

### 5.1 Interview #1 – *name and title of person interviewed*

*(Impressions from interview; concerns and or convictions and reasons for these)*

Title(s):       Manager Power supply

- No concerns identified.
- Manager has been highly involved in Y2k work and testing. Has confidence the system will perform throughout 2000 and beyond.
- He also is highly aware of contingency plans and was involved in both 4/9 and 9/9 drills.

### 5.2 Interview #2 –

Title(s):       Manager communications

- No Y2k concerns

### 5.3 Key Concerns of Utility Managers

*(Include anything that may be helpful in understanding the reasons for the concern)*

- Program is thoroughly organized and has been reviewed by multiple audits resulting in no concerns to management.

## 6. Key People Participating in the Assessment

### 6.1 Utility people (Titles only)

Millennium Project Manager  
Operating Officer  
Legal Counsel  
Systems Analyst  
Engineers

## 7. EMS/SCADA/Real-time Comments

### 7.1 Preparations

- Preparation for the Y2k conversion began with a 1997 survey from the Millennium Project Team. Surveys were sent to all departments to identify areas where Y2k issues may exist. The results provided the project team with information on all systems and rated the criticality for one system or device.
- Inventory, assessment, remediation, and testing of equipment took place at department level and results were reported to the project team.

## **7.2 Vendor Responses**

- The utility contacted vendors regarding Y2k status for devices and systems. Copies of vendor responses are filed with device or system inventory files at the project team level. Responses were received from all five RTU vendors and the SCADA/EMS vendor.
- The utility did not rely on vendor response as a means of assessment for the SCADA/EMS system.

## **7.3 Testing**

- Each type of RTU and the SCADA/EMS system was tested using a subset of the GM Y2k testing procedures in stand-alone mode and as part of the integrated SCADA/EMS testing.
- The testing documentation (procedures and results) is filed by inventory item.
- Testing documentation was complete for the sample SCADA/EMS checked during the visit. The testing procedures used extensive date sets including 12/31-1/1 rollover, 2/28-2/29 rollover, and 2/29-3/1 rollover in multiple modes including power on, power off, stand alone and integrated.

## **7.4 Sign-off/Certification**

- Sign-off of Y2k readiness took place at the department level. The SCADA/EMS system was considered ready in April 1999, as represented in the NERC reporting.
- Internal and external audit verified the system methodology.

# Profile of Organization Visited      Site Number 19

## 1. Year 2000 Readiness

*Select Level 1, 2 or 3 from below (delete those that do not apply)*

**Based on the information gathered from the on-site review, the assessor is to make an evaluation of the organization's EMS/SCADA/Real-time systems ability to meet readiness dates for all mission critical functions. The assessor will assign an overall level of risk based on the following:**

- ☒ Level 3:      Organization should meet a readiness date of 10/31/99 for EMS/SCADA/Real-time systems and will be Y2k ready by 12/31/99.

The assessors reached this conclusion based on the following insights:

- Pursued SCADA vendor for update and readiness information.
- Performed a thorough test of the SCADA system to verify control, status, and analog functions of all the substations.
- Contracted vendor for "Y2k Health Assessment" of operating system and implemented necessary remediation.
- Participated in 9/9/1999 drill.
- Good testing documentation from 9/30/1999 SCADA testing.
- Early acceptance and action (1997) acknowledging potential Y2k issues
- Excellent customer awareness documentation and practices (website, newsletter, inquiry response).

## 2. Profile of Utility

### 2.1 General statistical information

Utility Type:	Distribution Cooperative
Annual Gross Revenue (Year):	\$163M (1998)
Control Area	No
System peak Demand:	500 MW
Demand Characteristics:	
Number of Customers	128,000
Number of Residential Customers	116,500
Number of Commercial Customers	11,500
Number of Industrial Customers	16
Number of Other Customers	Irrigation – 22, Street Light 42
Number of Substations:	55 (7 transmission)

### 2.2 Local Y2k environment

*(Include relevant information about the utility such as what fuel base is used for generation, black start capability, types of loads served by the utility, critical loads, dependence on power from others, degree of integration with other utilities etc.)*

- Critical demands are identified on the system to help determine the priorities of demand restoration.
- Utility is dependent on its power supplier, who has stated Y2k readiness. The utility has monitored its power supplier's readiness activity and has been informed of its drills (4/9 and 9/9) and its contingency plans.

- The utility primarily serves a residential-type demand. Service area is about 11,000 square miles in 14 counties.
- Hospitals – All have generation (utility has also leased additional generation)
- Prison – Backup (utility also leases)

### 3. Year 2000 Readiness History

#### 3.1 Start of Y2k preparation

*(When did the preparation begin and at whose initiative. What was the budget and personnel allocated to achieve Y2k readiness, key people in Y2k project with reporting – organization chart if available to be attached)*

- Preparation for Y2k began in the third quarter of 1998, and it was included in the 1999 budget.
- Preparation and realization began in the early 90s when the utility added a new database to its system and had to add additional digits for the century.
- In 1993, the utility started using an outside vendor for CIS, accounting functions, payroll, and meter reading. This vendor has updated all their software and advised its readiness.
- In 1997 the utility formed an in-house Y2k committee consisting of employees from five departments to ensure all systems and software would be ready for Y2k.

*(Role of outside consultants and auditors)*

- Vendor assessment of operating system and layered applications was performed. This approach was an extremely cost-effective means of testing the readiness of the SCADA computer operating system.

#### 3.2 Assessment strategy for EMS/SCADA/Real-time

*(Inventory process or the method used to identify inventory – walk through, BOM combinations etc. Identification of all possible components, all digital or only the critical digital systems. Definition of critical (i.e., business critical or mission critical - keep the lights on)*

- The inventory process identified systems as being date dependant and/or having a microprocessor unit.
- Systems that were not considered date dependant were not tested or evaluated further.
- Critical systems were identified as those required to operate the SCADA system.
- Internal staff was utilized for the inventory.

*(Assessment strategy/testing- relied on vendor information, sample testing, simple testing – reduced data set etc.)*

- Vendor information was used to determine Y2k readiness for non-critical systems.
- Testing was performed on critical systems.

*(Critical supplier approach - Method used to identify critical suppliers; e.g. purchase records etc. (power suppliers, fuel suppliers, water suppliers, phone service, and other vendor strategy)*

- Critical suppliers were identified as those who are needed to deliver electricity to the customers.
- The power supplier is considered a critical supplier. This utility is completely dependant on its supplier of electricity and the integrated facilities that deliver the power.

### 3.3 Test strategy and procedures for EMS/SCADA/Real-time

*(Risk based priority test strategy - highest business impact tests first and more comprehensive tests applied. Lower impact not tested at all or at a less detailed level or other strategies)*

- The SCADA Load Management system was tested as an integrated system to test the functionality of the entire system.

*(Testing procedures - Compliance assessment testing: test date and date transitions testing; Application tests; validation tests (of remediation work); Differentiation between large and complex systems and small, stand-alone systems with embedded chips; Integrated tests or unit tests; Test audits)*

- A month-end test of the actual system was performed in the early hours of the day to minimize the data loss. The system is used to create a database of actual demands, and this information is lost when the system date is changed.
- The functionality of the system was verified by operating the system before, during, and after the 12/31/1999-01/01/2000 date rollover.

### 3.4 Remediation strategy for EMS/SCADA/Real-time

*(Fix or replace; in-house versus outsourcing; live with the problem and adjust settings manually; differentiation between large and complex systems and small stand-alone units)*

- The utility chose to upgrade its system in-house to obtain Y2k readiness.
- The utility performed upgrades on the operating system and computer software, as well as the SCADA software and hardware upgrades provided by the manufacturer. See section 7.2 further details this activity.

### 3.5 Customer information and survey responses [Omitted for Phase II]

*(Active customer contacts to avoid irrational behavior of customers at the transition from year 1999 to 2000; response to requests for information on Y2k readiness from others such as local phone company, hospitals etc.)*

### 3.6 Quality control to ensure that Y2k readiness is achieved and maintained

*(Role of inside auditors; outside auditors, NERC test participation, procedures in place to ensure that readiness state is not lost as a result of warranty changes, upgrades etc.)*

- Contract language changed to Rural Utilities Services (RUS) format (Y2k).

### 3.7 Contingency plans for EMS/SCADA/Real-time

*(Horizon for plan, trial of plan procedures, special staffing and manual controls at the transition, self-generation and special provisions to deal with large load swings, dependency on public communication systems and preparedness for phone system – including cellular system –overloads etc.)*

- The Information and Communication Technology department is responsible for SCADA system and plan to have five people on duty for the rollover (12/31-1/1).
- Additional staff will be at the energy control center and critical substations as a precautionary measure.

## 4. Position of the Utility at Time of Assessment

### 4.1 General position on EMS/SCADA/Real-time

*(Progress on schedule towards Y2k readiness; budget spent versus projected, remaining work; criticality of this work; participation in April 9 NERC Exercise; opinions of auditors – if any etc.)*

- The utility considered its system Y2k ready at the time of visit. Testing was completed by 9/30/99 following the final vendor upgrade.

### 4.2 Review of plans and relevant documentation

*(Existence of documents; errors and omissions in documents; vendor/supplier readiness information etc.)*

### 4.3 Review of test records

*(Existence of test procedures; test result documentation; completeness on testing to known problem dates, test procedures likely to catch the known problems; reliance on vendor information or actual testing of mission-critical systems, use of test data from sources such as EPRI, other utilities or other organizations with relevant data etc.)*

- The SCADA test procedure documentation included a checklist of the tests that were performed and a copy of the system log.
- Testing was not performed for leap-year dates.
- The organization coordinated with its power supplier for the 9/9/1999 NERC test.

### 4.4 Retest of selected equipment/systems

*(Selection process – assessors allowed to select or utility selection, repeat of test generated, same results as when utility (or tester) did the test last time etc.)*

A newsletter video recapping on the Y2k testing was viewed by the auditing team, which outlined the following steps for the test:

1. Created a backup of the current database
2. Real system was disconnected from the data retrieval systems.
3. Date was set ahead to the latter hours of 12/31/1999 so it would roll over to 1/1/2000
4. The system rolled over to 1/1/2000 without having initial errors.
5. Control functions of each of the 58 substations were performed. The functions including data gathering, alarms, load management.
6. Rollover date didn't affect operation of the system

The documentation for the test includes a copy of the system log and a list of the individual processes before and after the rollover.

## 5. Interviews

### 5.1 Interview #1 – *name and title of person interviewed*

*(Impressions from interview; concerns and or convictions and reasons for these)*

Title(s):        Communications Engineer  
                     Systems Analyst  
                     Network Administrator  
                     Director of Operations  
                     Supervisor of the Energy Control Center

- The interview was conducted with a large group of staff people, and their expertise covered all areas related to the SCADA system.
- The group was willing to discuss their readiness effort, and it was apparent that everyone is comfortable that their system is ready.
- The group was willing to discuss its testing, but was not willing to perform a retest. They stated that they didn't want to loose any data, but it is likely that a test could have been designed that would not have lost any data.

### 5.2 Interview #2 –

Title(s):        Vice President of Information Technology

### 5.3 Key Concerns of Utility Managers

*(Include anything that may be helpful in understanding the reasons for the concern)*

- Managers expressed concerns about equipment vandalism that could result in system outages.

## 6. Key People Participating in the Assessment

### 6.1 Utility people (Titles only)

Information and Communication Technology Department Director  
Communication Engineer  
Energy Control Center Supervisor  
Division Chief (Ops Support)  
Electric System Ops Support  
Director of Operations

## 7. EMS/SCADA/Real-time Comments

### 7.1 Preparations

- Process to upgrade to Y2k readiness was started three years ago through vendor discussions (1997).
- Because of several layers of software operating the SCADA system the utility asked for a "Y2k Health Assessment" for the operating system and layered products.



## 7.2 Vendor Responses

- SCADA vendor kept missing deadlines for upgrades. Initially the upgrade was to be shipped in April 1999 but it was received 5 months late. Once installed it would cause the system to lock up.<sup>1</sup> Engineers at the utility were able to identify issues and manually update the system<sup>1</sup>.
- Computer operating system and layered products were identified as Y2k ready with the exception of TCP/IP and motif layered products. The vendor indicated the utility would require expensive upgrade to become Y2k Ready, a local representative for the vendor eventually persuaded the vendor that only a couple of files were needed as the utility did not need all the “accessories” of the Y2k patch – just a few upgrade files.

## 7.3 Testing

- September 30, 1999 transition (12/31/1999-1/1/2000) test performed.

## 7.4 Sign-off/Certification

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<sup>1</sup> The three-hour update ended up taking a week. The process was slow because of slow vendor support coupled with inaccurate and incomplete information for the vendor.

# Profile of Organization Visited      Site Number 20

## 1. Year 2000 Readiness

*Select Level 1, 2 or 3 from below (delete those that do not apply)*

**Based on the information gathered from the on-site review, the assessor is to make an evaluation of the organization's EMS/SCADA/Real-time systems ability to meet readiness dates for all mission-critical functions. The assessor will assign an overall level of risk based on the following:**

- ☒ Level 3:      Organization should meet a readiness date of 10/31/99 for EMS/SCADA/Real-time systems and will be Y2k ready by 12/31/99.

The assessors reached this conclusion based on the following insights:

- Early acceptance and action to avoid potential issues
- Completed vendor recommended update to attain readiness and obtained certifications of Y2k readiness for SCADA system components
- Performed full scale integrated testing for rollover and was able to duplicate process as a re-test
- Systematic approach (by area) for inventory, assessment status, and testing allows identification of progress over time
- Contingency plan provides for manual operation (and restoration) of system in the event of failure
- Awareness of power supplier Y2k status and contingency
- Responded to requests from NERC (NRECA) and other interested parties on Y2k status; proactively advised members of Y2k efforts and status in newsletter

## 2. Profile of Utility

### 2.1 General statistical information

Utility Type:	Distribution Cooperative
Annual Gross Revenue (Year):	\$197M
Control Area	No
System peak Demand:	615 MW
Demand Characteristics:	The system is winter peaking when they experience extreme cold conditions. The winter peaks have been as high as 900 MW
Number of Customers	149,810
Number of Residential Customers	136,910
Number of Commercial Customers	12,596
Number of Industrial Customers	43
Number of Other Customers	261
Number of Substations:	36

### 2.2 Local Y2k environment

*(Include relevant information about the utility such as what fuel base is used for generation, black start capability, types of loads served by the utility, critical loads, dependence on power from others, degree of integration with other utilities etc.)*

- The utility does not operate any generation facilities.
- This utility is dependent on the generation and transmission infrastructure of their main supplier and others in the pool to deliver power to their customers.
- A SCADA system is owned and operated by the utility and is used to operate the transmission and distribution system.
- Most of the demand is comprised of residential customers.
- Critical demands are identified on the system and used to prioritize the outage restoration procedure.

### 3. Year 2000 Readiness History

#### 3.1 Start of Y2k preparation

*(When did the preparation begin and at whose initiative. What was the budget and personnel allocated to achieve Y2k readiness, key people in Y2k project with reporting – organization chart if available to be attached)*

- The mainframe applications were first reviewed starting in July 1996 and the SCADA system was assessed in July 1998.
- The Director of Information Technology (leader of the Y2k team) and the Senior Engineer performed most of the SCADA/EMS readiness work.
- The director of financial services was responsible for the utility's readiness.

*(Role of outside consultants and auditors)*

- Outside consultants or auditors were not utilized for this process.

#### 3.2 Assessment strategy for EMS/SCADA/Real-time

*(Inventory process or the method used to identify inventory – walk through, BOM combinations etc. Identification of all possible components, all digital or only the critical digital systems. Definition of critical (i.e., business critical or mission critical - keep the lights on)*

- The Y2k team directed all work groups to review the systems in their respective areas for possible Y2k issues and an inventory form was used to gather this information. A summary of these items and their readiness status was updated throughout the Y2k readiness process.
- The components of the EMS/SCADA system were considered critical and assessed as to whether they were dependent on a date function.

*(Assessment strategy/testing- relied on vendor information, sample testing, simple testing – reduced date set etc.)*

- The Y2k assessment of the SCADA system utilized vendor information to determine initial readiness. The vendor indicated that there was a need to update the operating system and the SCADA software and that the RTUs did not need any changes.

*(Critical supplier approach - Method used to identify critical suppliers; e.g. purchase records etc. (power suppliers, fuel suppliers, water suppliers, phone service, and other vendor strategy)*

- Y2k statements of readiness were requested from a comprehensive list of vendors and suppliers. There were five critical suppliers identified in addition to the SCADA supplier, and readiness statements were received from these vendors.
- Y2k readiness statements of the phone service providers were pursued but not yet received. The internal phone system and voice mail systems have been updated to be Y2k Ready. The utility expects that the phone service providers will be Y2k Ready.

### **3.3 Test strategy and procedures for EMS/SCADA/Real-time**

*(Risk based priority test strategy - highest business impact tests first and more comprehensive tests applied. Lower impact not tested at all or at a less detailed level or other strategies)*

- The Y2k team determined that the SCADA system date rollover test of the SCADA computers would be performed. This test would verify all components in the system that do not have their own independent date functions, such as the RTUs.

*(Testing procedures - Compliance assessment testing: test date and date transitions testing; Application tests; validation tests (of remediation work); Differentiation between large and complex systems and small, stand-alone systems with embedded chips; Integrated tests or unit tests; Test audits)*

- The main effort of SCADA readiness work was to update the computer platform software and operating system.
- The system was tested after the upgrades for 12/31/99 by changing the system date, and executing a command such as voltage control. The system display was able to read the voltage before the command, and showed the expected voltage reduction after the command. The results of this test are attached for reference.
- Rollover tests were not completed for other dates.

### **3.4 Remediation strategy for EMS/SCADA/Real-time**

*(Fix or replace; in-house versus outsourcing; live with the problem and adjust settings manually; differentiation between large and complex systems and small stand-alone units)*

- The update of the SCADA system operating system and software were adequate to bring the system into Y2k readiness. There were not any manual operations that would have to be performed for the system to operate correctly.

### **3.5 Customer information and survey responses [Omitted for Phase II]**

*(Active customer contacts to avoid irrational behavior of customers at the transition from year 1999 to 2000; response to requests for information on Y2k readiness from others such as local phone company, hospitals etc.)*

### **3.6 Quality control to ensure that Y2k readiness is achieved and maintained**

*(Role of inside auditors; outside auditors, NERC test participation, procedures in place to ensure that readiness state is not lost as a result of warranty changes, upgrades etc.)*

- The utility prepared the NERC Y2k Ready reports and also participated in the 9/9/99 utility test.

- The Y2k team monitored the readiness status of all items being upgraded.
- A component of the phone system was upgraded during the period of monitoring readiness, and Y2k readiness was included in the terms and conditions.

### **3.7 Contingency plans for EMS/SCADA/Real-time**

*(Horizon for plan, trial of plan procedures, special staffing and manual controls at the transition, self-generation and special provisions to deal with large load swings, dependency on public communication systems and preparedness for phone system – including cellular system –overloads etc.)*

- If the utility experiences system failure, the plan is to send crews out to the substations and coordinate operations using the mobile radio system. The plan is considered adequate because the utility has crews that perform maintenance on the substations, have access to the substations and use the mobile radio system to communicate.

## **4. Position of the Utility at Time of Assessment**

### **4.1 General position on EMS/SCADA/Real-time**

*(Progress on schedule towards Y2k readiness; budget spent versus projected, remaining work; criticality of this work; participation in April 9 NERC Exercise; opinions of auditors – if any etc.)*

- The SCADA system has passed the Y2k Ready tests and the utility is comfortable that they are prepared. The SCADA vendor has provided a statement verifying Y2k readiness of the current version of software.
- The new phone system must still be tested for readiness; it will be done by internal staff.

### **4.2 Review of plans and relevant documentation**

*(Existence of documents; errors and omissions in documents; vendor/supplier readiness information etc.)*

### **4.3 Review of test records**

*(Existence of test procedures; test result documentation; completeness on testing to known problem dates, test procedures likely to catch the known problems; reliance on vendor information or actual testing of mission-critical systems, use of test data from sources such as EPRI, other utilities or other organizations with relevant data etc.)*

- The utility did not provide any documentation of the test procedures. The utility log was believed to be available, but was not found during the time of the audit.

#### 4.4 Retest of selected equipment/systems

*(Selection process – assessors allowed to select or utility selection, repeat of test generated, same results as when utility (or tester) did the test last time etc.)*

- The results of on-site testing of the SCADA system supported the reported results of earlier tests, which were not well documented.
- 1. The system was set to 12/31/1999 23:59 and rolled to 1/1/2000
- 2. A voltage control operation was performed
- 3. The initial voltage was 124 volts, and the voltage after the control was 120  
Voltage control operations are scheduled for midnight each day, and those operations were part of this test.
- 4. The SCADA screens displayed the status of these operations and they were all satisfactory.
- Screen shots from the testing before and after are on file.

#### 5. Interviews

##### 5.1 Interview #1 – *name and title of person interviewed*

*(Impressions from interview; concerns and or convictions and reasons for these)*

Title(s):        Engineering technician

- This person was not very involved with the Y2k preparedness, but was aware that the systems were being updated.
- The duties of this person included writing and maintaining Dbase programs, which were being updated as needed for Y2k readiness.

##### 5.2 Interview #2 –

Title(s):        Control Center Supervisor

- This staff person was very aware of the SCADA system components and the upgrades that have been installed.
- This individual was very involved with the Y2k readiness testing of the system and performed the re-test of the system.
- The Y2k testing was considered to be adequate from this person's perspective, but was not aware of a contingency plan beyond using the second SCADA computer platform.
- The SCADA system is viewable from the corporate network and operations can be performed with the correct password. Access to the system is not possible through the internet, but can be gained through a dial-up modem. The modem is not connected to maximize security to the system.

##### 5.3 Key Concerns of Utility Managers

*(Include anything that may be helpful in understanding the reasons for the concern)*

- The stability of the power grid was voiced as a possible concern, but is considered outside of their immediate control.
- Everything that is within the control of the utility is believed to be Y2k Ready.

## **6. Key People Participating in the Assessment**

### **6.1 Utility people (Titles only)**

Director-Information Systems  
Senior Engineer  
System Analyst, Data Processing  
Director of technical services

## **7. EMS/SCADA/Real-time Comments**

### **7.1 Preparations**

- Vendor contacted SCADA and RTU vendor in early 1998 to assist/assess Y2k readiness.

### **7.2 Vendor Responses**

- The vendor provided information on the Y2k readiness in July 1998 and stated that an upgrade to the operating system and software was needed.
- The utility had to repeatedly request the update and readiness statement, but was eventually satisfied with the response and results.
- SCADA vendor provided utility with a list of steps to attain Y2k readiness.

### **7.3 Testing**

- Following the system upgrade, the utility tested the system with power-on for the 12/31-1/1 rollover. Documentation of testing procedures was not readily available. The utility plans to reproduce this documentation.
- Event logs from testing indicate it was successful and no problems were encountered.

### **7.4 Sign-off/Certification**

- The SCADA vendor provided the utility with written certification for the system readiness.